Electrical World

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Customer Ownership and Employee Securities

THE wisdom of public utility companies which when they settled on a policy of selling their junior securities to employees and customers determined to sell only preferred stock—and about 98 per cent of the stock so sold has been preferred—has oftentimes been justified, but never more so than during the recent crisis in the stock markets of the country. As every one knows, common stocks of all kinds came tumbling down during the flurry in rather precipitous fashion, and it was inevitable that bonds and preferred stocks should react slightly in sympathy. But while here and there a stone may have been chipped the wall withstood the assault admirably. Obviously, with value and earning power back of the preferred stocks, their worth as an investment is admitted and, from the way they held up in a wild market, fairly proved.

Thus the policy of selling only preferred stock to customers and employees has been vindicated in a very dramatic fashion. Good public relations as a consequence remain undisturbed, and the faith of employees in their industry is heightened.

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Die-Hards Continue to Make World Safe for the Reactionary

"OH, YES," said Thomas A. Edison, in discussing his endeavor, at eighty-two, to find a new source of raw rubber, "I had a lot of chemists who might have been able to assist me, but I had to let them go. They knew too much." On the basis that only virtually complete open-mindedness is to be acceptable there would be little if anything accomplished in this world —if for no other reason, because of the lack of qualified workers—but it is quite a typical Edisonism to start close indeed to the beginnings and drag reluctant facts from nature with scant regard for the supposed knowledge on the subject.

A few days past a group of electrical engineers confronted with a problem upon which the efficient engineering future of their industry in a measure depends protested that they did not want to talk about the way in which it should be done but to hear how some one had successfully done it so that they might take the best of the developed experience as a working aid. "The way to resumption is to resume," admonished the late Chief Justice Chase many years ago, and if the accomplishments of the next twenty years are to be limited, out of reasonable proportion, to the hodge-podge of the present, it is indeed unfortunate.

In the final analysis there can be so little classified as "facts," so pitifully little termed as "knowledge," that it is almost disconcerting to find didactic individuals who imagine themselves able to set up such lines of demarcation. Positivism is the comforting refuge of those who are unwilling to doubt. But the doubters, though they be scourged of the evening, find their ideas momentarily emblazoned with the dawn. The minority is proven right with a truly fine consistency.

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Power Predominates at Tokyo

DELEGATES from twenty-six countries attended, last week and this, the first power and engineering congresses to be held in Japan. They received a royal welcome and enjoyed meetings wherein eight hundred papers were presented and discussed. It has been gratifying to find the Tokyo conferences so well supported and attended, for no nation deserves the plaudits of the engineering fraternity in greater measure than Japan. In a few years this country has reached parity with Western nations in engineering and manufacture.

The meetings dealt largely with the development of national power resources and the use of power for industrial advancement. Delegates from this country contributed many papers that admirably reviewed and recorded the experiences and practices of the United States. These papers went far in pointing out that it is the availability of electric power rather than its cheapness that is the great asset of American industry. They also accented the advantages of the large power systems using both fuel and hydro plants and yet pointed out that considerations of high-quality service militate against the use of long-distance transmission because of the handicaps from lightning.

Delegates from other countries presented similar papers dealing with their local conditions, and the composite presentation and discussion gave to each nation ideas and perspective with which it can go forward in its power program with greater confidence. World-wide conferences are essential aids to international well-

being. They are as vital and as practical as international banking conferences and display none of the diplomatic evasions so prevalent at international political gatherings. The Tokyo meeting has been such a success that there is little doubt that the Berlin conference next June will be equally noteworthy. It is to be hoped, however, that the Berlin conference will be broader in scope and will take up economic topics in addition to engineering discussions. Delegates to these conferences are men who know their subjects and have something to say. They should not be compelled to speak through political mouthpieces concerning economic and engineering matters of vital importance to world progress.

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Making Costs Public

OLD-TIME executives of the power industry who used to discuss costs in a secluded corner of the office behind cupped hands and in sepulchral whispers would probably turn in their graves if they could read recent newspaper publicity of the New England Power Association in connection with prospective system improvements. Other companies are also taking advantage of such opportunities to tell the public how much real money is being appropriated and expended to increase and improve service.

Why should such costs be printed? The answer is that dollars are a better popular yardstick than kilowatts in the expansion of a power system. Itemized costs broken down into sections of engineering interest are necessary in many regulative proceedings, and it is easy enough to pick out important totals for popular reading so that the ordinary newspaper buyer may visualize in simple units what is being planned. The only pitfalls are unauthorized release of such data in non-useful forms and inconsistent presentation. Engineering department co-operation with the publicity staff insures picturing developments with correct perspective.

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Furnace Atmospheres in Heat Treating

ATMOSPHERES in which metals are heat-treated play important parts in heating processes. This condition opens up a field of metallurgical processing to which the electric furnace is admirably adapted. Scale has been and still is an annoying difficulty in almost all heat-treating operations. This has been recognized in the design of gas-fired and oil-fired furnaces, but in the direct type of these furnaces the atmospheres are limited to the constituents of the fuel gases themselves. Gas and oil fuels allow the heating of the metal in oxidizing, "neutral" or reducing atmospheres, which permit respectively the formation of oxides, the prevention of their formation or their reduction. But this is the limit of atmosphere control in direct furnaces of the combustion type. Muffle furnaces permit a greater latitude of atmosphere determination, but this design is markedly less efficient in heat utilization and is also less quickly responsive to methods of heat control.

In electric furnaces there is no relation between the source of heat and the gases surrounding the metal under treatment. Any kind of atmosphere can be introduced into the furnace without the accompanying loss of efficiency and lessening of heat-control response that characterize the muffle type of combustion furnace. Pure hydrogen, nitrogen, hydro-carbon or other gases that are intended to have chemical reactions on metal surfaces may be used with a definite result in view. There is a wide field for research in the choice of atmospheres and methods of control.

Much has been done to develop this new atmospherically controlled type of equipment, but the electrical industry has not been very aggressive.

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The State Line Mystery Unfolds Itself

STATE LINE station, which during the five years of its construction has been largely a place of mystery, is now open to the world. The curtain is drawn aside and the station is revealed—a finished product. Its 208,000-kw. turbo-generator unit, the order for which three years ago startled many in the utility industry, is now in operation. It holds for the moment the distinction of being the largest in the world. But, as the designers have said, they "look forward humbly to the day when the station will be a pigmy among giants."

Some elements of the station may appear radical to conservative minds or conservative to radical ones, but the designers have an enviable record of accomplishment, so it is reasonably safe to assume that every new idea incorporated in the station was thoroughly tested under every condition that could be foreseen.

As pointed out in the last issue of the ELECTRICAL WORLD, the outdoor metal-clad generator bus, switching equipment and transformers, which make overhead exposed wiring unnecessary, probably constitute the most radical feature. It took courage to decide on this type of construction. Cost data thereon would be exceedingly interesting. Experience will show what operating advantages this type of switchgear offers over the indoor masonry type and the outdoor open type.

Other features include 22,000-volt generation, five-stage feed-water heating, four vertical condensers per unit, remote circulating pumps, compact boiler house, roof-type flue-dust removers, under-water coal storage and integral transformers and lines. One may ask, why generate at 22 kv. and step up to 33 kv. instead of generating at 33 kv. as is being done in London? But

at the time the machines were ordered American manufacturers were, no doubt, still hesitant about making quotations on 33-kv. generators. It is less than a year ago that 33-kv. generators were suggested editorially in the ELECTRICAL WORLD. The extent of auxiliaries is amazing—305 motors, totaling 26,000 hp., only a few years back would have required an entire power house to serve them alone. The question may be raised, why so many voltages for these auxiliaries? But no doubt the station designers were influenced by available equipment.

Every new power house should show some improvement over previous ones. State Line shows many improvements. It is an outstanding achievement. The day of the large station has arrived, and the courageous designers of the State Line plant make possible actual performance data upon which future stations will be built.

Beyond the Dawn

SINCE immemorial time the mind of man has sought to pierce the veil of mystery concealing nature's laws. In those vague gropings of his earliest intelligence both science and religion had their humble origins. Slowly, and bit by bit, through countless generations, the edifice was reared.

Man is still eager to pierce the veil, perhaps more eager than ever before. But where, in former times, the search for truth and the adaptation of knowledge through invention were processes carried on by isolated individuals, we now use the co-ordinated efforts of many.

What can be accomplished by a well-organized group of scientists was strikingly demonstrated at a recent meeting in New York. When an artificial larynx can be made that restores speech to the voiceless, and when this artificial voice can be amplified to be heard by thousands; when, despite engine noise, communication is established between airplane and ground; when secrecy is attained in radio telephony by adding a device that "scrambles" the frequencies, making the sounds unintelligible, and another to reverse the process; when inaudible vibrations are projected electrostatically directly into the brain, to be perceived as sound—when all this is done, the mind may well be overwhelmed with wonder. But we are not overwhelmed. We marvel. We admire. We know that mankind is successfully adapting itself to the new conditions created by its own ingenuity in the past, and that it expects the same in the future.

Great individual contributions to scientific knowledge there will no doubt be in times to come as in the past. Genius is not bound by usage or rules. But on a problem that can be resolved into its elements, to be attacked simultaneously, group research saves time. Its results can more speedily be translated into human convenience, comfort or welfare. It constitutes another tool to pierce the veil and to peer beyond the dawn.

The Promotional Rate Wins New Friends

"WHEN the householder desires to use appliances of any description such a [promotional] schedule encourages the use of these devices at prices the customer can easily afford to pay." "With the straight-line meter rate in effect the customer notices a definite and proportionate increase in his monthly bill. The effect of this is to discourage the rapid acquisition of appliances for convenience and labor saving." "The practice of some companies of reducing maximum rates where they are already relatively low is deplored. Every time this is done it merely passes more of the burden to the customer who desires full uses of electricity in his home."

These vigorous and unequivocal utterances are culled from a recent report of the N.E.L.A. Commercial National Section speaking through its promotional rates committee. They are heartily welcomed as implying a concerted commitment of a committee to a departure that has proved its merit and leaves little consolation to its opponents when measured in terms of results. The promotional rate is here to stay and to spread, and there certainly can be no harm in confirming this manifest fact in a serial report.

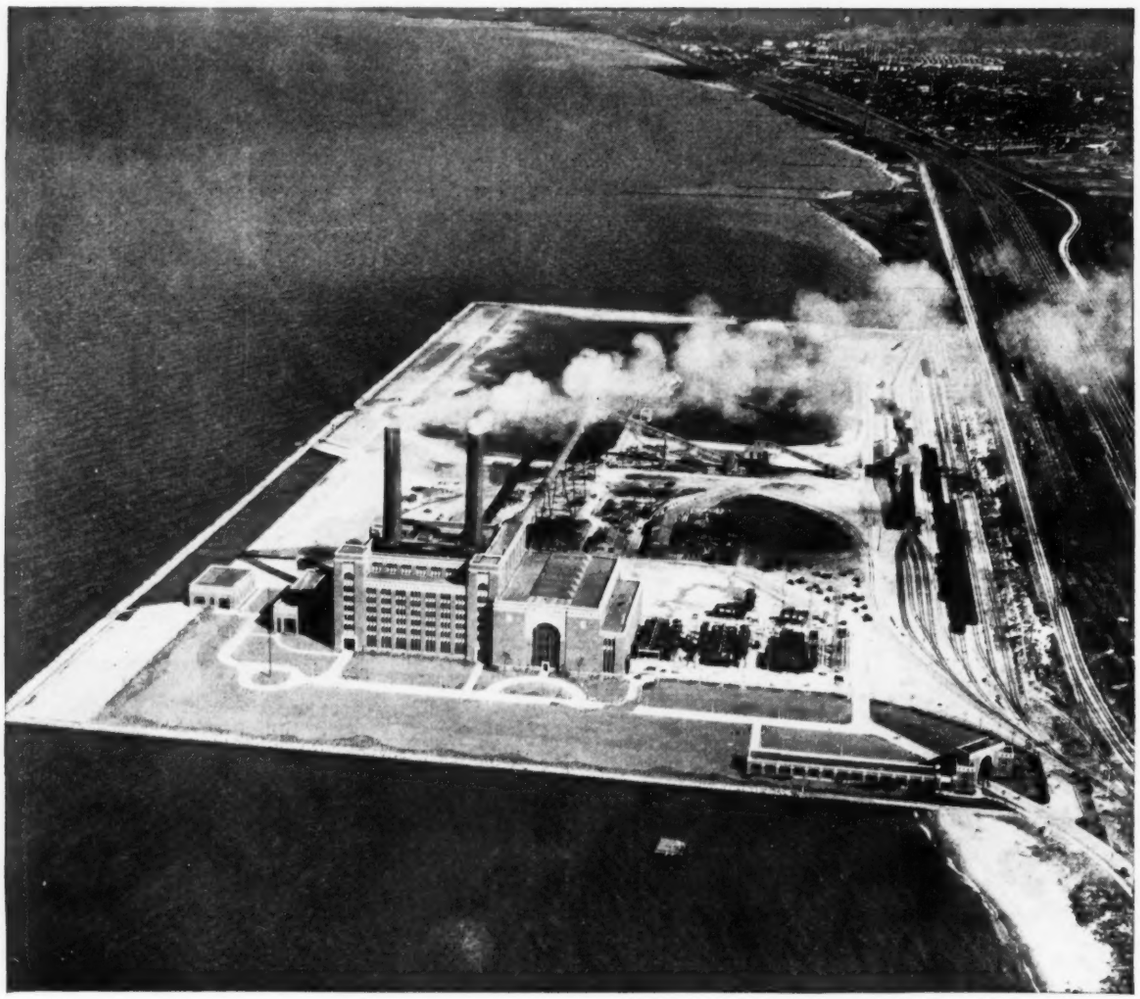
The committee digresses for a clause or two to claim a social service medal for the power industry when it shall have promoted a comprehensive use of electricity in the home. Thus: "We know of no more constructive work for central-station companies than increasing the use of electrical appliances in the home. There is nothing that will add more to the ease and pleasure of living than making it possible for the householder to use more electricity at a lower average rate." From a new angle comes this support for the proposal that the electrical industry soft-pedal for a time the emphasis on kilowatt-hours and apply the loud speaker for an evening in enlarging upon the civilizing and cultural potentialities of electricity as a service, not a commodity.

The report discusses the conventional forms of rates and then deplores the multiplicity of variants in vogue. "Most of these are quite apparently based on the individual ideas of some employee of a company who has been asked to give some attention to the rate subject. The committee has no quarrel with the development of individual ideas. . . . But, on the other hand, it seems to your committee that it would be for the advantage of the industry if it should abandon some of the more complicated forms now in use in different cities and more generally adopt some of the simpler forms that have been found practically successful, but without any idea of stopping progress in case any better form still shall be discovered."

The mild arrangement of the chaotic conditions of electric rates took courage. The decision to adopt the recommendations of the committee will depend on the changing proportions of the sensible to the sensitive among the executives and rate experts.

State Line—

A 208,000-Kw. Unit for Chicago Power Pool



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APPROXIMATELY 73 acres of shore space on Lake Michigan was filled in, near the Indiana-Illinois boundary, to offer a site for the new State Line station of the State Line Generating Company, an Insull project. The important features of this thoroughly up-to-date plant are described on page 871 of the November 2 issue.

A Critical Analysis of Station Auxiliary Systems

Emphasizes the necessity of viewing the problem in perspective to determine which of the trends are warranted and which are not. Relative merits of systems and suggestions for simplification

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A MODERN steam plant can be compared, and frequently has been, with a human organism, the boiler plant being comparable to the stomach and accessory digestive organs, the turbine and generator to the heart, the control board to the central nervous system, the main cables to the blood vessels and the control cables to the nerves. With this comparison the importance of the auxiliaries becomes at once obvious. The essential heart auxiliaries are the coronary arteries which are taps from the aorta and the branch nerves from the cardiac plexus to the heart. Failures of any of these two types of auxiliaries are in most cases fatal, resulting in the first case in coronary thrombosis and in the second case probably in angina pectoris.

Similarly, a failure of any of the most important turbine auxiliaries will often result in a complete shutdown of the unit. For a long time the auxiliaries of steam plants were treated in a haphazard manner, being given very little consideration in the original design, pumps and motors being added as they came along, and there was nothing resembling a systematic treatment of auxiliaries. Psychologists may say with perhaps some justification that the old neglect was partly due to the term "auxiliaries" and that they would have received more attention if they had been called "essentials." Perhaps it is not too late to begin talking of "steam plant essentials."

With the introduction of very large units there came a realization of the importance of treating the station auxiliaries systematically; most plants adopted electric drives for practically all auxiliaries, and the electrical engineer found himself confronted with a switching and wiring problem which called for more serious study and scheming than the problem of the main switching system. Many new ideas were introduced into the treatment of the auxiliary system, and even though some large plants are even now being built which show an amateurish handling of the auxiliaries, the great majority of large plants show at a glance the great amount of serious thought which has been devoted to this problem. The time seems to be ripe to systematize and summarize the various subproblems involved, to discuss the fields of applications of the various methods used, and to see what further improvements may be expected in the future.

Economic Aspects.—In the great competition among plant operators to make a record of a minimum number of B.t.u.'s per kilowatt-hour reliability of auxiliaries was often sacrificed to economy in B.t.u.'s. But it was soon found out that it meant false economy, because one shutdown is a greater loss than all the savings in B.t.u.'s. And now it is generally conceded as a first principle that the first and last consideration in auxiliaries is reliability of service. In reality there need be no disagreement whatever between reliability and economy, because competent station design will produce the greatest economy for the most reliable installation.

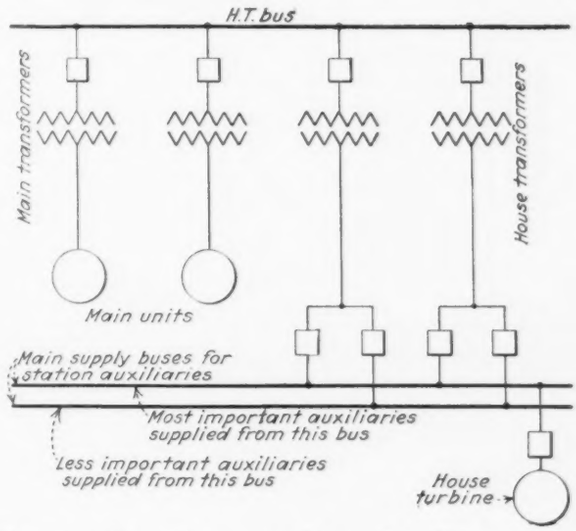


Fig. 1—Transformers Stepping Down from High Tension and House Turbine Serve Station Auxiliaries

Source of Energy.—A transformer connected to the main bus, stepping down to a suitable motor voltage, is the oldest method of supplying energy to auxiliary motors. For large stations in which a transformer of the same size as the generator is connected to each generator stepping up to high transmission voltages, two or more banks of house transformers were generally provided, stepping down from the high transmission voltages to the motor voltage.

Due to the cost of high-voltage switching and great amount of space required for transformers this plan proved uneconomical for voltages over 66,000 volts, and for such cases many recent power houses show one house transformer connected directly to each generator, paralleling these transformers on the low-tension side only, but providing a breaker in each transformer, also on the generator side, to allow for differential protection.

Another scheme which has been used in a number of cases provides a generator transfer bus, with a switch on each generator, interlocked so that only one generator is connected to the transfer bus at one time. This method allows the use of a smaller number of transformers than there are generators, but calls for a comparatively elaborate bus arrangement at generator voltage and elaborate interlocks, because without interlocks the transfer bus would not be a transfer bus at all, but would become a main generator bus, making it possible to parallel all the generators on this bus and calling for oil circuit breakers with sufficient rupturing capacity to break the system short. In all these schemes the auxiliaries depend for their energy supply on the main system and are subject to influences from system disturbances.

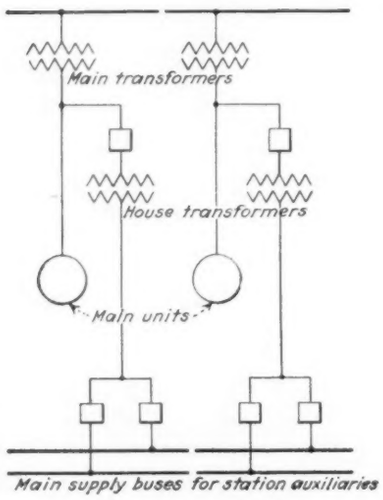


Fig. 2—Auxiliaries Supplied by Generator Transformers

Where an incoming supply of energy from another power house is available, it can be treated as an additional main generator as far as the house transformers are concerned.

The house turbine was first introduced, not primarily as a reliable energy supply for auxiliaries, but as a matter of economy in the heat balance system. Later on bleeder turbines became popular and the heat balance could be accomplished without the house turbine. The house turbine, however, was retained as an emergency standby for most important auxiliaries, the normal operation of the auxiliaries in such stations being from any one of the transformer schemes described above. The house turbine thus appears either as a "spinner," running idle normally and picking up the most important auxiliaries when the transformer system fails, or as a quick starting "pick-up," normally not running at all, but starting up quickly when the transformer system fails. Both of these house turbine schemes call for a very careful division of most important and less important auxiliaries in normal operation, operating the most important on a separate bus to which the "spinner turbine" or the "pick-up turbine" is connected, to make sure that not more load than the small unit can carry is automatically put on it in emergency.

The latest and most promising scheme is the use of shaft generators, small generators for auxiliaries only on the main turbine shaft. It has the great advantage of having no electrical connections whatever between the auxiliaries and the transmission system, and the further advantage of making it possible to connect all the shaft generators in parallel without resorting to enormously expensive breakers, and furthermore does away with the necessity of spinners or pick-ups, and the resultant careful division of most important and less important motors. Of course, a small non-condensing unit should be available in every large power house for starting the plant from a total shutdown, and in the case of high-pressure stations a Diesel would probably be the most convenient type for this purpose. An entirely independent set of turbo-generators for auxiliaries has been suggested in some cases, but this scheme does not offer sufficient advantages over the shaft generator scheme to offset the great difference in cost and the corresponding difference in steam economy.

Voltages.—For the largest units now being used motors may become so large that 6,600 volts will have to be considered the logical voltage, but in most cases 2,300 is the best voltage for all large motors for the present. Such motors can be had as low as 25 hp. and should be used. For the smaller motors it is preferable to use separate transformers to step down to a lower voltage than to use tertiary winding on the main house transformer, if house transformers are used, for the principal reason that transformers with tertiary windings are quite special, and it is very difficult to determine the load on the tertiary winding in time to obtain good delivery on the transformers; 550 and 440 volts are not very practical for station auxiliaries, due to the fact that they are almost as dangerous to handle as 2,300 volts, and yet are subject to being treated as low voltage, and to the further fact that very few manufacturers have suitable starting equipment for these voltages. Using 2,300 volts for the large motors, 220 is no doubt the most suitable voltage for the smaller motors. Where direct-current motors are needed 250 has been the most popular voltage, but 550 volts has also been used.

Motors and Starters.—The best quality motors must be used for station auxiliaries regardless of cost. For a long time it was not possible to obtain constant speed motors for starting on full voltage, making it necessary to provide compensators, and the resultant low-voltage protection for a long time constituted the greatest nuisance in the station auxiliary system, causing the greatest number of shutdowns. At the continued insistence of power plant engineers all manufacturers were forced to study this problem thoroughly, and now squirrel-cage motors for across the line starting can be had for practically all sizes and voltages. To the best of the writer's knowledge, the new power house of the Manila Electric Company was the first in which all constant-speed motors were for across the line starting.

The variable speed motor is still quite a problem for station auxiliaries. For stoker drives it has been found most convenient to provide small motor-generators and use direct-current motors, but for fans slip-ring motors are most commonly used, and since automatic combustion control has come into use schemes have been developed to allow the motor to start at any position of the controller within a certain range, so that here, too, the low-voltage protection nuisance can be done away with. The question of brush-shifting motors versus slip-ring motors must be investigated in each case, both now being considered quite reliable and each offering some advantages over the other. The field of the variable-speed motor calls for further study and improvements are to be expected. Perhaps a

very good solution for some fan drives will be found in the method now quite common for elevator control, which would call for a motor-generator and direct-current motor for each fan.

Electrical control of motors offers the advantage over hand control of making it possible to combine a number of motor switches or starters into a remotely located switching structure and locating a push button near each motor, or combining the push buttons and instruments into a centralized control board.

Auxiliaries Identified with Units.—Attempts have been made to have a transformer connected to a generator or a shaft generator take care of the auxiliaries of the individual units, thus making each unit self-contained with its auxiliaries. While this may be possible at times with turbine auxiliaries, there are not many plants in which it would be economical to operate separate boilers for each unit, without any main steam header, and a turbine unit is seldom identified with definite boilers. But even aside from this there are many auxiliaries in the turbine room as well as in the boiler house which cannot be identified with any particular unit, such as spare motor exciters, cranes, coal and ash handling equipments, etc. So that the idea of a self-contained auxiliary system for each unit must be discarded in most cases.

System of Connections.—In the beginning there was chaos. A group of oil switches here, a 440-volt fuse box there, cables running through the station, from which motors were tapped as required, motors were purchased with driven equipment, each manufacturer furnishing his own favorite type of starting equipment, so that the auxiliary system of an older power house represents a museum of starting and switching equipments.

Soon it began to dawn that the auxiliary load of a power house is a very important customer and must be treated as such, and the idea of systematically establishing "substations" in various parts of the power house soon crystallized itself, some of these substations being larger than many a customer's substation. It was at Pine Grove that the term "auxiliary substation" was first employed, and it has been extensively and successfully used since.

The establishment of auxiliary substations logically led to the separation of the system into main auxiliary buses and local substation buses, two sets of main buses generally being provided, from which two feeders run to supply each substation bus, the main buses and switches being under the control of the principal switchboard operator and the substations under the control of the various floor men. Such systems are now in general use in all well-planned large plants.

Rather radical simplification may be suggested here,

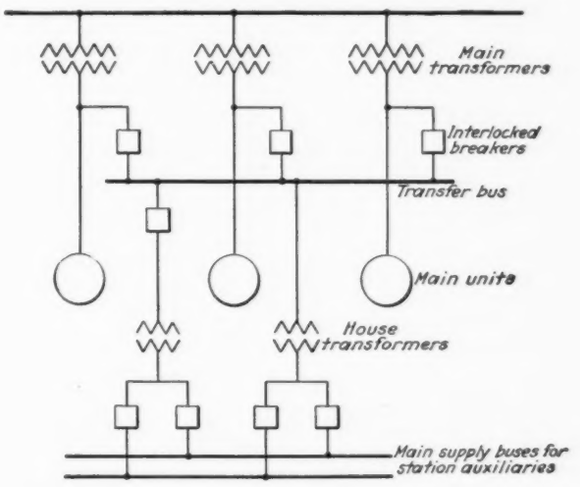


Fig. 3—Generator Transfer Bus Feeds Auxiliaries Through Transformers

which will no doubt bring forth considerable criticism from the conservative operator and station designer, but which nevertheless deserves to be considered seriously, because if it is possible to carry it through whole or in part, it will eliminate an enormous amount of switching equipment which is now considered a necessary evil, and the money for which is always spent with a great deal of reluctance, always leaving behind an impression of unnecessary extravagance. All auxiliary pumps and other apparatus of any importance are always installed

Aspects of Station Auxiliary Systems that Deserve Systematic Analysis

1. *Economic Aspects:*
   - A. Economy.
   - B. Reliability.
2. *Source of Energy for Auxiliaries:*
   - A. Transformer stepping down from high-tension system.
   - B. Transformer connected directly to each main generator.
   - C. Incoming energy from other power houses.
   - D. House turbines.
   - E. Shaft generators.
3. *Voltages to Be Used on Auxiliary Motors:*
   - A. 6,600 volts.
   - B. 2,300 volts.
   - C. 440 or 550 volts.
   - D. 220 volts.
   - E. Direct current.
4. *Motors:*
   - A. Constant speed.
   - B. Variable speed.
5. *Turbine Room Auxiliaries:*
   - A. Auxiliaries identified with individual turbine.
     - (a) Most important.
     - (b) Less important.
   - B. Auxiliaries not identified with any one turbine.
     - (a) Most important.
     - (b) Less important.
6. *Boiler House Auxiliaries:*
   - A. Auxiliaries identified with individual boiler.
     - (a) Most important.
     - (b) Less important.
   - B. Auxiliaries not identified with any one boiler.
     - (a) Most important.
     - (b) Less important.
7. *Switches and Starters:*
   - A. With low-voltage protection.
   - B. Without low-voltage protection.
   - C. Manually operated.
   - D. Electrically operated.
   - E. Disconnect only.
8. *System of Connections:*
   - A. Main connections.
   - B. Connections to individual motors.
9. *Instruments*
10. *Cable.*
    - A. Varnished cambric or paper.
    - B. Rubber.
    - C. Cable sizes.

in duplicate or even in triplicate, but it is always possible to get along at least without one of each type. Furthermore, if, for instance, one condensate pump out of two is shut down, the corresponding second circulating pump, hot well pump, etc., are of very little use, and might as well be shut down too. The idea offers itself at once to eliminate all automatic switches from the individual motors and to take care of a group of motors by one automatic switch, which would be set so high that it would only trip in case of a motor burn-out or a cable short circuit.

Motor and cable failures are quite infrequent, and it seems extravagant to provide an expensive automatic outfit for each motor, which often costs considerably

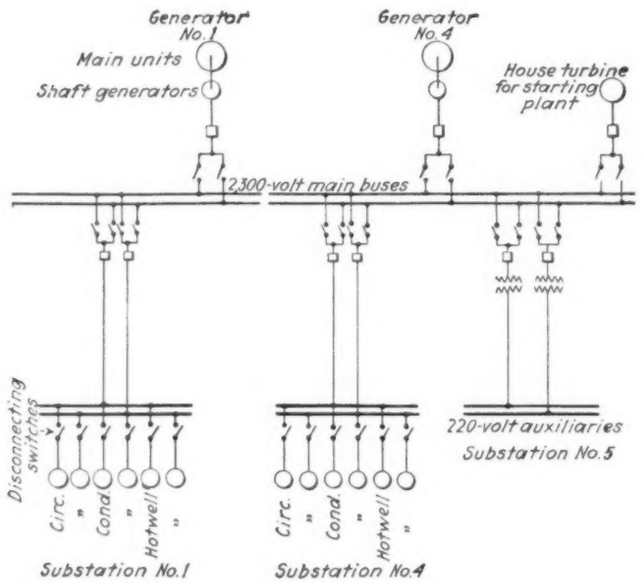


Fig. 4—Suggested System of Auxiliary Supply Eliminating Automatic Switches on Individual Motors

more than the motor itself. It would seem quite proper to take a chance and trip off a whole group of motors in such an emergency. The motors of each unit can be divided into two groups, each group containing one of each type of auxiliaries. When both sets of pumps are running and something happens to an individual motor, causing one of the two whole groups to trip off, there would be no more disturbance to the system than if only the individual motor tripped off. If only one set of pumps is running and the other standing idle with its switch open, a simple interlock could be provided to throw in this second switch and thus start the other group automatically. The individual motor would only require a safety type disconnect, similar to those now commonly used on network transformers, so interlocked with the automatic group switch that the disconnect cannot be opened when the group switch is closed. A lamp indication could easily be provided, so that when a group breaker trips it would at once indicate which motor caused the trouble, so that this individual motor could be quickly disconnected and all other motors of the same group put back into service if necessary. This arrangement would not only reduce the cost of auxiliary switching but would simplify the operation, and any simplification in operation represents economy.

A system of connections for a station containing any number of large units is shown, which eliminates automatic switches on individual motors. This diagram shows only part of the auxiliaries in the turbine room, merely for the purpose of illustrating the principal idea. Other auxiliaries in the turbine room can be similarly grouped and an additional group with a pair of supply switches can be provided for odds and ends. Some motors can be equipped with double-throw disconnects, if it is convenient to arrange them for being thrown onto either of two groups. Such details have to be worked out in each case, giving due attention to the definite operating condition in the individual power house. Similar groupings can be worked out for boiler auxiliaries after giving due attention not only to operating conditions but also to the physical arrangement of switching equipment and the relative locations of the various switching structures to the motors. Any one who had experience in power house design knows that a single-line diagram for a power house very often has to be changed when the physical conditions are investigated. The system shown in Fig. 4 assumes the use of shaft generators, both as a contrast to Figs. 1 to 3 and because the shaft generator idea lends itself more readily to this new switching scheme, principally by eliminating the necessity of an accurate distinction between most important and less important auxiliaries.

The principal drawback to this system will probably be found in the fact that it is as difficult to obtain a nearly correct list of auxiliaries at the beginning of a design from the mechanical engineer as it is to pull his teeth.

Instruments.—There is really no need of any instruments, recording or indicating, either in the individual motor circuits or in the group circuits, the only thing of interest being the total auxiliary load for accounting purposes and for the efficiency engineer's reports. Experience shows that ammeters and wattmeters and even power-factor meters which some power houses provide in every motor circuit are never looked at. It would be well, however, to provide facilities in each motor circuit at a convenient location, say in the form of terminal boxes, for testing purposes only, to check up on the load or the motor size of an individual pump. In fact, it would not be amiss for some one to design a standard motor terminal box for this purpose, suitable for mounting on the motor frame and perhaps even furnished with the motor.

Cable.—Most cables to motors in power houses have to run underground and are therefore lead covered. Pump motors, however, frequently have to be located so close to the floor that it is a very difficult matter to find space for a pothead between the floor line and the motor terminals. For this reason many power houses have standardized on 30 per cent or 40 per cent rubber cable for auxiliaries, instead of varnished cambric or paper cable, because rubber cable can be installed without potheads. Up to 2,300 volts the rubber cable is quite satisfactory if a good quality rubber is used. As to the cable sizes for motors, it may be suggested that the requirements of the National Electrical Code, which are quite correct for industrial applications, are too strict for the case of across the line motors in power houses, requiring either starting current rating for the cable or the use of special protective devices. It should be possible to have the code modified to provide exceptions for such motors in power houses, where the supervision of electrical equipment is much more competent than in industrial plants, and where a fire caused by an overloaded cable is practically unheard of.

Utah's Water-Heating Policy

Utility bases water-heating campaign upon satisfaction to its customers, reasonable operating expense and low installation cost. Clamp-on heater adopted

By H. M. FERGUSON

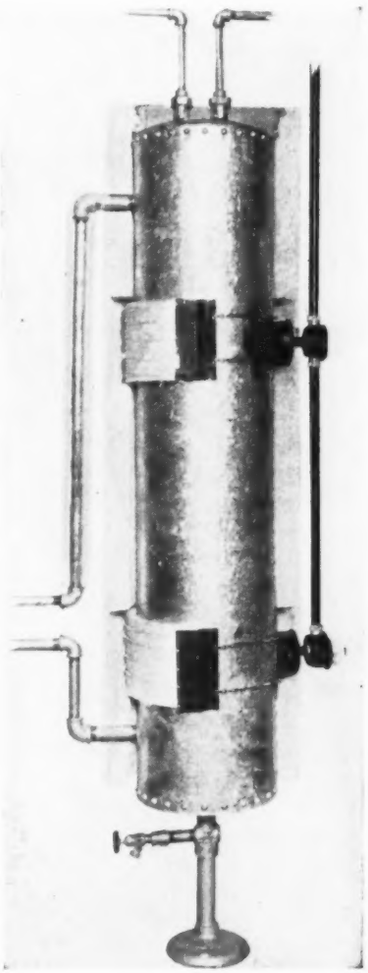
Assistant to Vice-President and Commercial Manager
Utah Power & Light Company, Salt Lake City, Utah

ELECTRIC water heating to be successful must, like every other service, be satisfactory to the customer and attractive financially to the company rendering the service. To be attractive to the customer hot water must be available and in sufficient quantity when needed, the cost for service must be reasonable and the installation expense low. Water heating as a load, to be attractive to the utility, must be satisfactory as regards load factor, diversity and rate, to the end that total net earnings per dollar invested may be favorably affected by the addition of this new load.

In approaching the problem of providing service satisfactory to the customer the Utah Power & Light Company made a number of observations as to quantity of hot water used for various purposes, together with desirable temperatures. It was found that the use of hot water in the ordinary home consists of intermittent small quantities with occasional use of larger amounts. Also, it was found that the maximum temperature is required for the washing of dishes and clothes and that this maximum temperature requirement will be satisfied if a temperature of 160 deg. F. is maintained.

By making use of the existing tank in the home, installing a heater about one-third of the distance from the top and operating this heater thermostatically, it was found that a sufficient supply of hot water could be maintained automatically to take care of the ordinary needs of the four-, five- and six-room houses which constitute a very large percentage of the homes in this territory. A second heater is installed near the bottom of the tank and operated manually by a snap-switch at the heater. This provides a supplementary supply of hot water for the occasional heavy use, such as for the bathroom and laundry.

Incidentally, the use of the shower bath instead of the tub has in many instances made it unnecessary to use the lower heater, except on laundry day. Originally rather frequent use of the lower heater was figured, but, in practice, it has been found that more than half of the so-called standard jobs rarely use the lower heater, although the customer likes to have it for an emergency. In cases where partial tank storage is not sufficient the lower heater also is placed on thermostatic control and full tank storage is maintained. If the line of least resistance were followed thermostats would be installed on both heaters to make sure that the quantity of hot water is at all times more than ample. Experience, however, has shown that this arrangement often leads to waste in the use of hot water, with resulting high bills. Greater success has resulted from adhering to the standard installation, not so much to reduce radiation losses as to prevent careless use of the service. This type of installation is already in use in about 1,000 homes in the company's territory and has been applied to tanks ranging in size from 30 to 120 gal. with universal success.



Clamp-on Water Heaters Installed on 30-Gal. Tank

The top heater is thermostatically controlled while the lower heater is on snap-switch operation.

The standard installation for the ordinary 30- and 40-gal. tanks consists of 1,000-watt heaters both top and bottom, as shown in the accompanying sketch. As the use of hot water increases, greater heater capacity is used for larger tanks, although the largest installation made consists of only 4,000 watts total on a 120-gal. tank, this installation operating at about 60 per cent load factor, and considering diversity due to automatic operation there is every reason to believe that the system load factor will be upward of 80 per cent, which is about the present system load factor for total business in Utah Power & Light Company territory.

While it has been necessary to sell these jobs intelligently and follow them up to a certain extent to make sure the application fits the home, the number of reports of satisfactory service have been gratifying. It has been necessary in a small percentage of cases to make minor changes after the first installation, mainly because

Electric Water Heater Installation Makes Neat-Appearing Unit for Kitchen

it is impossible to determine in advance the quantity and type of service demanded, although a short period of operation with the standard set-up, and occasionally the use of a curve drawing instrument, have clearly pointed the way to necessary changes to bring about satisfactory service. In fact, salesmen frankly state to prospective purchasers that the right combination may not be struck the first time, and usually changes that later were found to be necessary have been well received by the customers because the ultimate arrangement always proves satisfactory.

At the present time a clamp-on heater with thermostat turning on the current at 140 deg. and off at 160 deg. is being used. All heaters are rated at 230 volts and are connected by two No. 12 wires, all wiring being done in accordance with the National Code. The tank cover is constructed of a special paper wound on a mandril and split into two sections, as illustrated, the cover thickness being 2½ in. Pockets are cut on the inside of the cover to make room for the clamp-on heaters and the top of the tank is covered with an insulating cement.

A large percentage of homes in the company's territory are of the one-story bungalow type and the hot-water piping from the tank, located in the basement, is therefore horizontal. It has been found from tests that the local circulation between the tank and the faucets is so small that it does not enter seriously into the monthly bill. Therefore, non-circulating seals have not been included in the installation. All items, such as pipe covering, etc., which would add to the installation expense and sales effort have been eliminated, and this policy seems justified because complaints of high bills are almost unknown for many hundreds of heaters that are already in operation, many of them for several months.

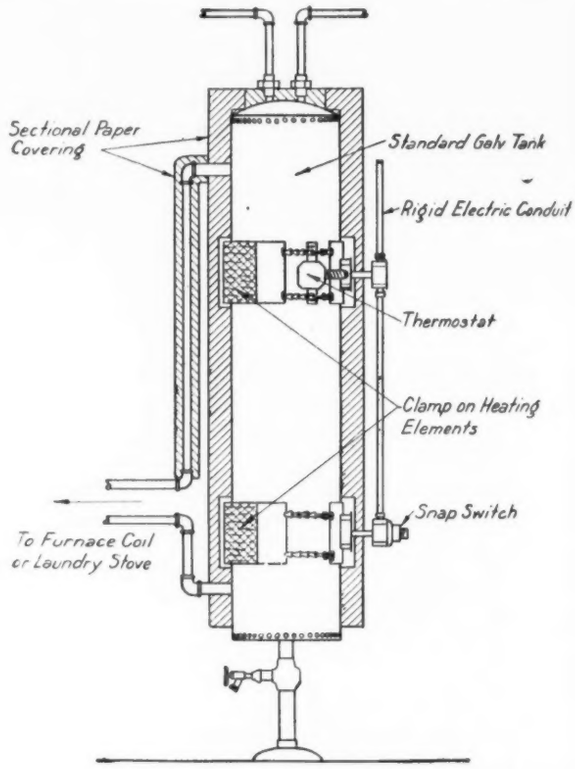
Water heaters are installed only where electric ranges are in use, no double-throw switch or other peak-limiting device being required. The service is supplied along with lighting, power and cooking service in the home through one meter under the following rate schedule:

First four active rooms.....$1.25 per month
Each additional room..... 0.20 per month
Plus an energy charge of 2½ cents for the first 300 kw.-hr. and 1½ cents for all additional current; this rate being net.

The accompanying illustrations will more clearly bring out the details of the standard installation, briefly described above. From all observations made, the flexibility of this assembly, both in arrangement and operation, has made possible, even with the wide range of family habits, a thoroughly satisfactory hot water service.

Reasonable Operating Expense

As gathered from the foregoing comments, it is evident that little or no difficulty has been experienced in this promotional effort due to excessive monthly charges. The rate and the reasonable use of hot water seem to result in bills which are in line with the value of the service when compared with other methods of heating water, such as gas, coal and oil, which are available in this territory at moderate prices. It is important to note that the greatest success in selling this service was had when it was found wiser to discuss cost for all residential service, including hot water, as the total bill for all lighting, power and cooking seems to be more readily accepted as fair and reasonable than when the water-heating item is segregated and discussed separately. One reason for this is that the lower rate brought about by water heating has certain advantages in reducing the average cost of all electric service in the home, and additional electric uses, of course, come at



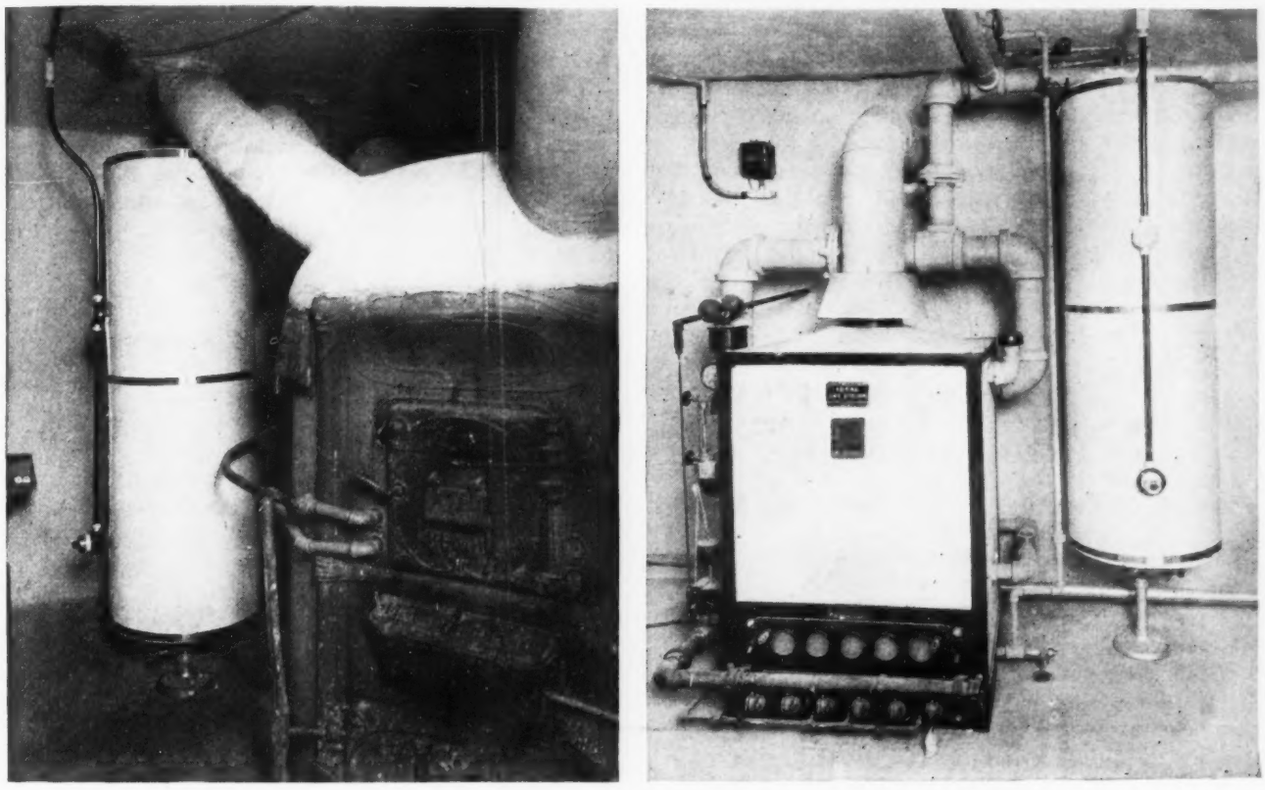
Clamp-on Water Heater Installation Adopted by Utah Company

very low increment costs. Refrigeration, for instance, when compared with the cost of ice, seems extremely reasonable, and with very little effort, the customer can be made to realize that with electric water heating a certain amount of coal or gas has been done away with, with a corresponding credit on the family budget. The customer's principal interest is in the total cost of running his home rather than what some single item may amount to, and if it is possible to show him that the total electric bill is not high for the total service obtained, the selling becomes comparatively simple. At any rate, this is the procedure being employed by this company and it seems to be bringing results.

For some time it has been felt that if satisfactory service could be rendered at reasonable operating cost, volume could then be secured only through the employment of apparatus which would not entail excessive outlay on the part of the customer. The company was not tempted to use cheap equipment which would not stand up in service, but felt that simple, durable material used in conjunction with the galvanized tank in the home would be a thoroughly serviceable device and efficient enough with a fair rate to make this service attractive to the customer and to the company. So far, with one thousand installations operating, there has been no occasion to reverse this opinion.

The complete standard installation described above for a 30-gal. tank is sold for $60 completely installed, including wiring, this being the time price for twelve monthly payments with 10 per cent discount for cash. Installations for tanks larger than 30 gal. have a slight increase in prices to take care of increased tank cover cost, and for the very large installations the price is, of course, increased to include the material furnished and work performed.

In making installations such minor things as stopping hot water leaks, moving tanks from kitchens to basements and other changes are being taken care of at the customer's request, these extras, however, being charged for. An attempt is being made to do a very complete and thorough job, so that the service will be satisfactory from the very start. It might be added that during the promotional stages of this business the company is doing all of the wiring and piping with its own men, although this is not the company's policy in other fields. It is felt that the business can be better handled if the customer has only one company to deal with, and during the early stages this has facilitated the work and avoided misunderstandings.



Two Basement Electric Water Heater Installations with Tanks Coupled to Furnace Heating Coils

In seeking heating apparatus that would be suitable it was necessary to bear in mind that hard water had to be dealt with. Tests made by the University of Utah showed that scale formation begins at 180 deg. F., the scale being a decomposition of calcium bicarbonate into calcium carbonate, water and CO_2. The calcium carbonate, together with other ingredients of the water, forms scale, the action increasing very rapidly as the temperature is increased above 180 deg. Observations in homes have revealed that water above 160 deg. is not necessary and the scale difficulty has been avoided by preventing the water from exceeding this temperature.

Through the use of the clamp-on heater, which has a very large area in proportion to the wattage, high local temperatures have been avoided. Experience, it is felt certain, will show that little or no scale deposit will appear on the inside of the tank, as this large area heater

operates at a very low temperature because of the small temperature differential, or low gradient, necessary between the heater itself and the water inside the tank.

Selection of Heater

Due consideration has been given to the types of water heaters available. In fact, the company experimented for more than ten years before engaging in this business. For the hard water conditions prevailing, the circulation type heater has been considered undesirable because of increased radiation losses and the high temperatures necessary in the heater, which produce heavy scale deposit. High temperatures are necessary in circulation type heaters to allow for the mixing of water from the tank with the cold water passing through the heater at times when water is being drawn. This mixing can be reduced, of course, by various methods, but no justification for the use of the circulating type can be seen because of excessive installation cost and the other objections mentioned.

Some very careful tests were made on insert heaters operating under the same conditions as the clamp-on type; that is, as to cover design, etc. It was found that such tests were merely insulation tests, as the two heaters deliver to the water in the tank the amount of heat corresponding to their wattage. In other words, it seems immaterial how the heat is introduced into the water provided the surrounding tank cover has the same insulating value. Careful tests carried on in the company's laboratory over a period of many weeks under several conditions of temperature brought out clearly that there is no merit in one heater over another so far as so-called "efficiency" is concerned. The choice of heater should be made upon other grounds if over-all benefits are to be considered.

With the clamp-on device the installation can be made at the desired location on the tank without the necessity of cutting a new hole in the tank and inserting a coupling, as is necessary with the insert, or immersion type. Also, it is believed that the same amount of current dissipated over a larger area is a more logical way to introduce the heat into the water, and as there is no price differential in favor of the insert heater, after additional labor has been taken into account, the company, at least for the present, is confining its activities to the clamp-on type heater.

It is also felt that the complete storage type heater with efficient cover and beautiful outside finish will meet with only limited acceptance on account of the relatively high cost. Public utilities, naturally, are interested in the widest possible acceptance of the electric water heating idea, and these higher-priced assemblies, having limited application, will not, in the judgment of the author, solve the problem. It is felt that the extra efficiency obtained, resulting in the case of this company in only a small saving per month, is not as desirable to the customer as a very large decrease in first cost which makes possible electric water-heating service in the home.

Construction and Operating Characteristics of

Neon Tubes

Extent of use. Advantages. Effect of operating voltage on design. Tube size and efficiency. Electrode design eliminates sputtering. Construction peculiarities

By Joseph Henry O'Neil

Claude Neon Lights, Inc.

THE neon lighting industry during the past few years has reached world-wide proportions. In the larger cities of Europe and North America, and more recently in Australia, New Zealand, China and Japan, they are increasingly evident. The neon business in North America alone last year totaled approximately $25,000,000.

Neon light has several outstanding advantages for electric display lighting. The colored light contrasts with the sunlight to secure effective daytime burning. Letters traced in neon have evenly distributed light which is quickly and easily legible. Neon is a cold light which obviates the waste of electric energy used up in the generation of heat.

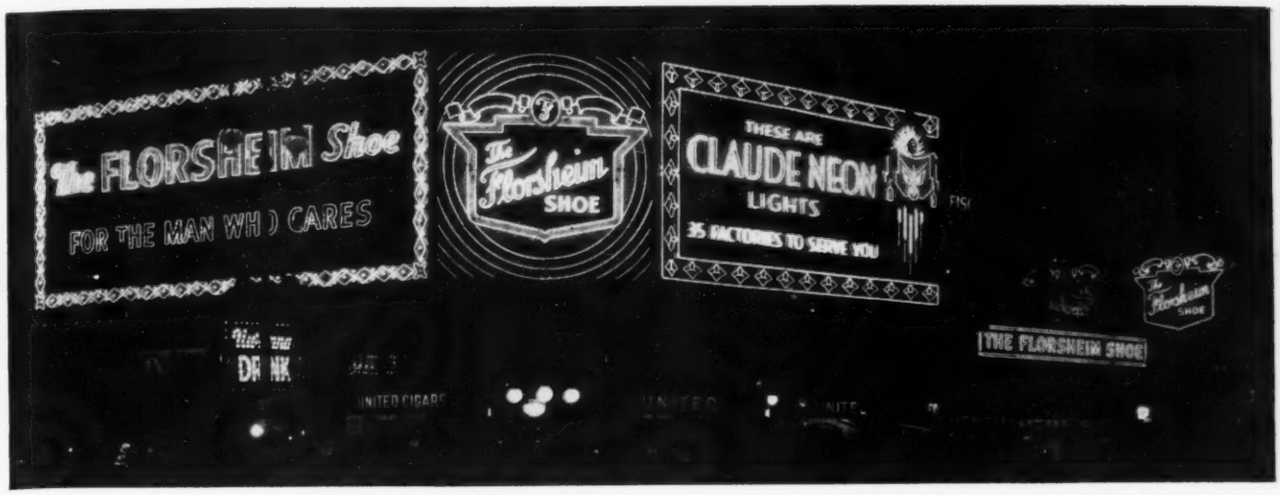
From 5,000 to 10,000 volts are required for approximately 50 ft. of tubing, which is divided into 5-ft. sections of glass for convenient handling. This high voltage is always confined to the cables within the sign box. Here lies one of the reasons why neon signs must be carefully constructed.

As a rule, the usual house current, 110 volts, is brought to the sign outlet. Inside the sign this current passes through a step-up transformer to secure the necessary voltage. The secret of efficient light lies in the use of the proper electrodes and the purity of the neon gas. Otherwise a sputtering is present within the tube, with a consequent using up of the neon molecules and a gradual dimming of the light.

Although neon tubes will glow with their distinctive reddish light when placed in an electrostatic field or by the high-frequency induction method, the most efficient uniform brilliance is secured by high-voltage alternating current. Where only direct current is available it is changed over by means of a rotary converter.

Construction Peculiarities

The nature of neon light necessitates certain construction methods not usual in lamp signs. In the first place the metal background supporting the glass should be firmly built to prevent waving or buckling of the surface.



Neon Lights Permit Varied Effects on Relatively Small Signs

This is accomplished by internal angle iron bracing. The extra weight of the transformers must be properly balanced and supported.

To place the tubes reasonably close to the metal the electrode ends are run into the interior of the box as far as possible, the length of the electrodes hidden and the size of the transformers contained governing the thickness of the box, which is usually from 8 to 10 in.

Lead glass is used for the tubes because of its durability and flexibility under the application of heat. It is bought in standard 4-ft. lengths, which are welded end to end when greater footage is required. By heating over a gas flame it can be bent to the desired design over a pattern traced on asbestos. Copper shell electrodes are then sealed in at each end of the tube.

To purge the tubes of impurities high-voltage current is passed through the tubes until it heats the glass walls to slightly below the melting point and raises the electrodes to a cherry red color. After the tubes are cooled they are subjected to a very high vacuum and pure neon, or the proper mixture of rarefied gases (depending on the color of light desired), is admitted.

Factors Determining Life

When electric current passes from electrodes through neon gas there is a tendency to sputtering, which means that heated particles of the electrode are loosened and unite with molecules of the gas, forming a deposit on the walls of the tube. This is overcome by using electrodes of sufficiently large surface. Laboratory test has fixed a minimum ratio of 1.5 square decimeters for each ampere of current to obtain tubes with a life in excess of 10,000 burning hours. Tubes on test have continued in operation for more than 25,000 hours and are still burning, so that no maximum life has yet been fixed.

Tubes have been made with electrodes of smaller surface area than the minimum stated above and compensated for by using neon gas at a high pressure within the tubes. But this procedure secures a life of only 1,000 to 3,000 hours, depending on the length of the tubes and sacrifices brilliance when using standard 25 milliampere current, for which most neon equipment is built. The higher pressure or denser gas requires more current per linear foot.

A peculiarity of neon is that the greatest efficiency in lumina per watt is secured with tubing of small diameter. When tubing exceeds 15 mm. the efficiency falls off rapidly. For most commercial purposes the tubing is standardized at 11 and 15 mm., which produce clearly defined brilliant light at 25 milliamperes. To secure comparable brilliance, tubing of 33 mm. diameter requires approximately 200 milliamperes, which is hazardous to human life. Except on aeronautical beacons, where visibility of upward of 25 miles is required, neon tubes should be limited to a diameter of 15 mm.

The efficiency of the neon light may be judged by the fact that it consumes only about one-fifth to one-tenth of that required for a lamp display of equal power. This saving in energy cost is a distinct advantage as it tends to make the users burn their neon lights during the daytime as well as at night. It is estimated that about 50 per cent of them are operated during the daytime.

The greater possibilities of design and color with neon has interested many businesses which previously did not use electric advertising. Banks, for instance, in most of the larger cities have adopted neon. Architects, too, are co-operating in the proper selection of neon displays and have gone so far as to provide for them in their original plans.

The fact that the majority of neon signs are sold on a term maintenance arrangement prevents them from becoming dilapidated and unsightly after a few years wear. As a result users of other lamp signs are inspired to keep their signs in better repair, thereby improving the appearance of entire sections.

If a neon sign is properly made and all foreign matter removed from the gas, if the electrodes are of proper specifications to prevent sputtering, if the glass tubes are properly sealed to prevent leaks, the neon is an extremely efficient light for commercial display purposes. Some neon signs have been in operation for more than four years and are still using the original tubes.

Used as airway guides in some parts of Germany, neon lamps are allowed to remain lighted 24 hours a day, because the wear and tear and extra energy consumed amount to less than the cost of the labor to turn them on and off.

The fact that neon may be flashed with almost instantaneous precision and that the volume of light is sensitive to the intensity of the current has played a vital part in the perfection of the telephoto, television, transatlantic telephone, etc., where screens of neon light are utilized.

Caterpillar Packs Coal to Avoid Ignition

COAL accumulated for normal long storage at the Big Sioux station of the Sioux City Gas & Electric Company receives a treatment designed to reduce the possibility of spontaneous combustion to a minimum. It is packed down. The method increases the capacity of the storage space by raising the average specific weight of stored coal from 58 lb. to 63 lb. per cubic foot. Although it costs a little more to store coal in this way, C. R. Brown, superintendent of electric production, believes that this cost is more than offset by the reduction of loss from burning in the pile.

Caterpillar Crane Distributes and Packs Down Coal for Prolonged Storage

The coal is unloaded from the cars by a locomotive crane to the ground, where it is distributed over a larger area than the boom of this crane will permit by means of a caterpillar crane. It is laid down in a bed whose thickness varies between 2 and 3 ft. The caterpillar crane then runs back and forth across the pile, using its treads to roll down the bed. This forms the coal into a compact mass and is said to squeeze out the air trapped between the pieces, without which combustion cannot be sustained. The rolling also tends to prevent moisture from trickling down into the pile and it is possible during wet spring weather to dig into the pile and find coal within a foot or less of the surface which is as dry as the day it was stored.

The process goes on, each additional layer being rolled down thoroughly by the crane running back and forth in one direction over the whole pile and then in a direction at 90 deg. to the original. The usual height of the pile is about 20 ft., which in Mr. Brown's opinion is both economical and safe.

As the pile is being built, some loose coal will roll down the sides and gather around the bottom. If left there this would be a fire hazard and defeat the purpose of rolling. The pile is trimmed around the edges before it is finished and all this loose part is removed and placed on top of the pile.

Coals from certain sections of Oklahoma, Arkansas and Illinois have given very good results in storing by the packing method. It is a mixture of these coals which make up the present large semi-permanent storage pile of the Sioux City company and which has been stored for a period of more than two years without a single case of spontaneous combustion.

Estimating Line Costs

THE frequent necessity for local employees of a widely spread out Middle Western utility to estimate line construction costs has caused that company to furnish such employees with material lists showing quantities and costs for 1-mile units of line. The accompanying table offers construction costs for a 33-kv. line, using No. 4 copper on 30- and 35-ft. poles. Costs on other constructions will appear in later issues. To the costs given here must be added cost of and clearing right-of-way, higher poles, if necessary, and other special features.

Costs of 1 Mile of 33-Kv., Single-Circuit Line

With three No. 4 conductors in flat configuration on 35 and 30-ft. poles spaced 175 ft.

Material	Size	Quantity	Unit Price	Item Cost
Poles	25 ft.	1	$6.50 ea.	$6.50
Poles	40 ft.	2	16.95 ea.	33.90
Poles	45 ft.	2	18.85 ea.	37.70
Crossarms	10 ft. 0 in.	37	115.00 C	42.55
Crossarm braces	No. 7953	37	80.95 C	29.95
Keystone stands and pins	No. 263	111	59.50 C	66.05
Carriage bolts	⅝ x 6 in.	74	3.95 C	2.93
Machine bolts	¾ x 12 in.	8	8.92 C	0.71
Machine bolts	¾ x 14 in.	25	9.50 C	2.38
Machine bolts	¾ x 16 in.	2	10.28 C	0.21
Machine bolts	¾ x 18 in.	2	12.12 C	0.24
D. A. bolts	⅝ x 16 in.	4	13.84 C	0.55
D. A. bolts	⅝ x 18 in.	4	14.56 C	0.58
Lag screws	½ x 3½ in.	50	24.99 M	1.25
Guy wire	⅜ in.	500	17.15 M	8.58
Guy clamps		12	19.79 C	2.38
Guy hooks		10	7.79 C	0.78
Strain plates		10	6.66 C	0.67
Anchor rods	¾ in. x 6 ft.	5	54.95 C	2.75
Everstick anchors	8 in.	5	2.00 ea.	10.00
Guy thimbles	¼ in.	5	4.50 C	0.23
Eyebolts	¾ in. x 12 in.	6	20.34 C	1.22
Insulators (Thomas pin type)	No. 2124	112	229.50 C	257.04
Insulators (J. D. complete)	No. A-275	6 str.	5.40 ea.	32.40
Strain insulators	No. 504	2	13.29 C	0.27
Wire M. H. D. bare copper	No. 4	2020 lb	20.00 C	404.00
Wire soft drawn (tie wire)	No. 6	50 lb.	20.00 C	10.00
Copper sleeves	No. 4	3	10.00	0.30
Ground rods	¾ x 5 ft. 0 in.	7	66.20 C	4.63
Traffic guards		1	1.55 ea.	1.55
Sq. washers	2¼ in.	100	15.64 M	1.57
Sq. washers	4 x 4 x ¼ in.	5	$3.58 C	$0.18
Total—Material common to both constructions				*$964.05*
Add to $964.05—for 35-ft. pole construction.				
Poles	35 ft.	31	$12.90 C	399.90
				$1,363.95
Total—Material for 35-ft. pole construction.				
Stores department—10 per cent				136.40
Labor				405.00
Transportation and supplies				95.00
				$2,000.35
Total—Material and labor.				
General office supervision				200.04
Total cost of 35-ft. pole construction				*$2,200.39*
Add to $964.05 for 30-ft. pole construction.				
Poles	30 ft.	29	9.85 C	$285.65
Poles	35 ft.	2	12.90 C	25.80
Total—Material for 30-ft. pole construction.				$1,275.50
Stores department—10 per cent				127.55
Labor				382.00
Transportation and supplies				95.00
Total—Material and labor				$1,880.05
General office supervision				188.01
Total cost of 30-ft. pole construction				*$2,068.06*

Progress and Future of Television

THAT television will require distinct and new receivers separate from the radio broadcast receiving set is now assured from the progress being made in laboratory and other television experiments, according to D. E. Replogle, chairman television committee, Radio Manufacturers' Association, Inc.

All transmitting to date is, frankly, experimental, and in cases where regular schedules are being maintained they are for the purpose of solving the difficulties and problems that must necessarily arise from regular sustained transmission.

While the above is a true statement of facts, it is not a pessimistic outlook on the future of television, because never before has there been such an intense concentration of engineering talent on the subject as has recently been noted. The very fact that the problems have been analyzed and definitely put in form is a real advance, and while it is impossible to predict how fast progress can be made in solving these problems, one would be very lacking in faith in modern engineering ability if he could not become enthusiastic over the ultimate success of this new art. The element of time is the only thing that cannot be definitely estimated.

Analysis of the present trend in television indicates very clearly that the first means of obtaining subject matter will be through the use of the talking picture films. The next step will probably be the photographing of outdoor scenes, and by means of a quick-developing film transmitter put them very shortly on the air. Several methods of doing this are now in process of completion and give good promise of success. Following this broadcasting of events as they occur seems logical. This, however, seems to be much more distant than either of the two other methods of securing subject matter.

Whereas broadcasting amplifiers with a frequency range of 50 to 5,000 cycles have been adequate for sound transmission, it will be necessary to have amplifiers with a range of 20 to 50,000 cycles per second for sight transmission. This alone presents a real difficulty.

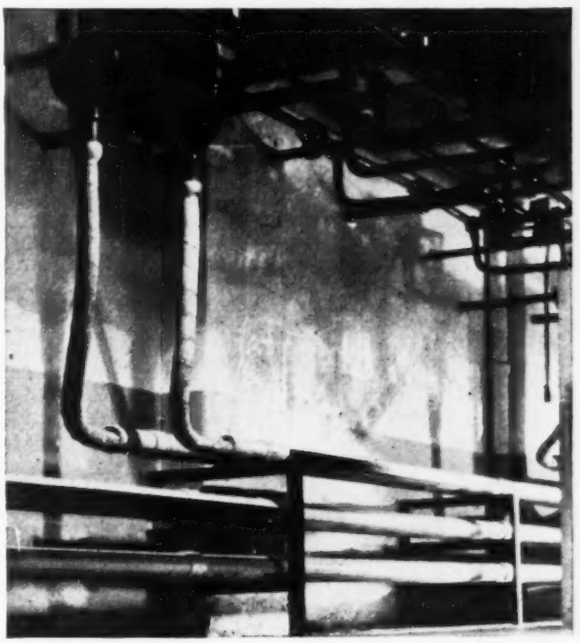
As the quality of television transmission and reception increases, synchronism by the power house frequency will, undoubtedly, become less and less satisfactory, and there are plans under way now to provide a universal frequency standard on the air, to which transmitters and receivers alike can be tuned in order to hold them in exact electrical step.

"Through-the-Dealer" Sales Plan Builds Load

THE average return to the San Joaquin Light & Power Corporation, Fresno, Cal., per kilowatt of heavy-duty cooking appliances installed is now $12.50 per year, as against an average of not over $6.50 for other utilities on the Pacific Coast, stated H. H. Courtright, president of the Valley Electrical Supply Company, Fresno, before the Association of Electragists International recently. This co-operative plan, which is well known in the industry, has been in use about five years. The number of dealers co-operating is 125. For 1929 the power company allows the Valley company, its merchandising subsidiary, $5 per installed kilowatt for merchandising, advertising and demonstrating service on heavy-duty appliances for the home. The power company is charged $3.30 per kilowatt for convenience outlet appliances sold by the Valley company, as against $3.66 originally. On small appliance sales 30 per cent are made for cash, 30 per cent more are paid for within a month and the remainder are carried through the time of the sales contract. The company serves 40,000 square miles, largely rural territory, having about 60,000 customers. The average energy consumption has increased from 460 kw.-hr. per customer in 1924 to 746 kw.-hr. in 1928. Sales of appliances in the territory have attained a maximum of 30,000 in a year and have risen from $22.50 per consuming customer in 1926 to $34.15 for 1928. The average outlay for this class of commodity on the Pacific Coast is about $15 per customer per year, the author stated. For every 100 electric ranges installed on the system 65 5-kw. water heaters are in operation, and out of every 100 pieces of heavy-duty equipment placed no less than 70 were sold to old customers. Trade relations have been greatly improved by the use of this plan.

Long-Life Cable Ducts

By T. A. Robinson
Engineering Department,
City of Winnipeg Hydro-Electric System



TO MINIMIZE the hazard in case of a 12,000-volt, three-conductor cable failure the city of Winnipeg Hydro-Electric System adopted the practice here described in one of its larger substations. The ten cables serving the station, after leaving the ducts, are trained into 3½-in. galvanized iron pipes which carry them to their respective potheads. These pipes are mounted on a steel framework made from standard 2-in. steel angles. The advantages of this type of duct work are: Permanence, yet with great simplicity of construction, so that a rearrangement, if required, can easily be made; good ventilation around the individual pipes and non-inflammability. The structure will have practically 100 per cent salvage value.

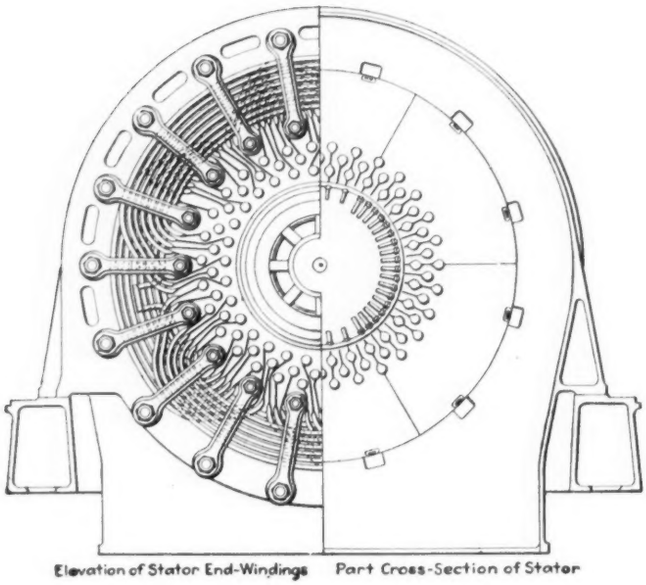
33,000-Volt Generators Save $1

By

CHARLES A. PARSONS

and

J. ROSEN



Cross-Section of Stator and Elevation of End Winding

The conductor slots of this first 33,000-volt, three-phase, two-pole, 3,000-r.p.m., 31,250-kva. alternator are arranged in three rows. Apart from the stator windings and mechanical details, which have been modified to meet special design features, this machine is of standard construction.

WHEN generators* can be constructed to supply a transmission system directly, without the intervention of step-up transformers, a sum representing the cost of the transformers and their housing and the capitalized value of their losses, less the additional cost of the high-voltage generator, can be saved. The various items in which there is a direct financial saving by the use of high-voltage generators may be summarized as follows:

(a) *Cables*—The cost of the cables between generators and switchgear or transformers increases rapidly with the current and size of unit.

(b) *Transformers*—These are usually three-phase units up to 20,000 or 30,000 kva. and banks of three single-phase units for larger outputs.

(c) *Transformer Losses*—The capitalized value of transformer losses represents a considerable part of the total capital outlay, and is so much greater than the extra cost of the high-tension generator that the saving of this expenditure is alone sufficient to justify the use of higher generating voltages, when transformers can be eliminated.

(d) *Transformer-Cooling Equipment*—The cost of running the transformer cooling-plant motors (oil pump and fan) must be added to the cost of fixed losses of the transformer, as the cooler is usually in service all the time the transformer is alive.

(e) *Buildings*—Transformer banks are now usually installed out of doors, but a certain expenditure is incurred for foundations and accessory structures.

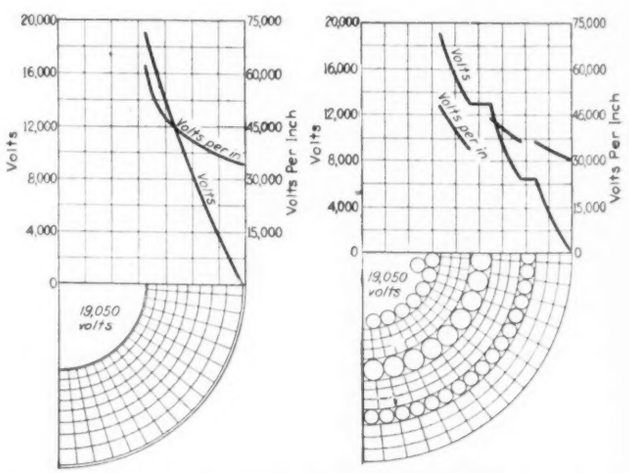
(f) *Switchgear*—The cost of switchgear increases rapidly when the current exceeds certain values, and may become excessively high for very large units at low voltage.

As a representative plant, a unit of 75,000 kw. may be taken, giving its full output at a power factor of 0.8, the equivalent output thus being 94,000 kva. It will be assumed that a generator of this output is wound for 11,000 or 33,000 volts and has to supply a network at 33,000 volts, so that a transformer bank will be necessary in the first case. It is assumed that the switchgear is on the 33-kv. side. The following comparison can then be made:†

	"A"	"B"
Generator output, kva	94,000	94,000
Generator voltage	11,000	33,000
Approximate additional cost of generator	.....	$50,000
Cost of cables (100 yd. run)	$18,825	$10,000
Cost of transformers	$95,000	.....
Transformer Losses		
Fixed losses, kw	250	.....
Variable loss at full load, kw	400	.....
Variable loss at 60 per cent load factor, kw	144	.....
Transformer-Cooling Equipment		
Input to motors, kw	50	.....
Reduction in cost of buildings, etc., and transformer foundations	.....	$2,500
Annual cost of fixed losses [at $5 per kilowatt (2 cents per unit)]	$7,000	.....
Annual cost of variable losses	$4,625	.....
Capitalized cost of transformer losses at 10 per cent	$116,250	.....

The 33-kw. machine thus shows a capital saving of $222,125, from which the extra cost of the former must be deducted, leaving a net saving of $172,000.

Where the generator voltage is stepped up to 66 kv. it



Potential Gradients and Voltage Drops Across Insulation for Single-Core and Concentric Conductors

The maximum gradient is considerably less in the three-core concentric cable. Flaws, such as cracks, or air pockets are less liable to occur in the concentric cable, as the layers of insulation are much thinner.

**Excerpts from a paper, "Direct Generation of Alternating Current at High Voltages," presented by the authors at meetings of the Institution of Electrical Engineers (England).*

†In this discussion costs estimated by the authors in pounds sterling have been expressed in dollars on the basis of 1£ = $5.

$172,000 in 75,000-Kw. Plant

Elimination of transformers through direct generation at 33,000 volts has been instituted abroad. Use of concentric cable in generator design

might be possible to take advantage of the low step-up ratio and effect a saving by the use of auto-transformers, thus:

	"A"	"B"
Generator voltage	11,000	33,000
Cost of cables (100 yd. run)	$18,825	$10,000
Cost of auto-transformers	$80,000	$48,750
Capitalized value of losses	$100,000	$62,500
Reduction in building costs	.....	$5,000
Cost of switchgear	$45,000	$31,000

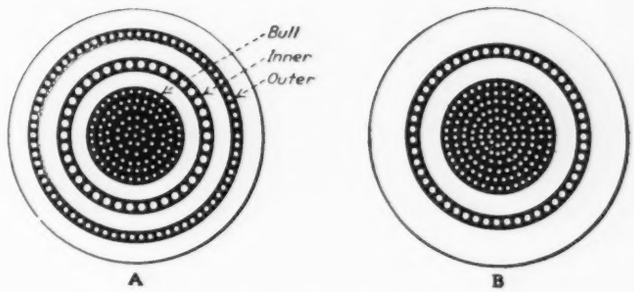
The total capital saving on the 33,000-volt generator is then $96,125 less $50,000, or a net saving of about $45,000.

The above figures are approximate, but are submitted as representative of the conditions prevailing at the date when the paper was written.

Table I—Capacity of Concentric Cable per Foot-Run

Position	Capacity μ F — Measured	Capacity μ F — Calculated
Between "Bull" and "Inner"	0.00018	0.00025
Between "Inner" and "Outer"	0.0003	0.0005
Between "Outer" and "Sheath"	0.00034	0.00046

The corresponding figure for a single-conductor bar of an 11,000-volt alternator of similar output is 0.00024μF per foot run obtained from test, the calculated value being 0.00028μF per foot run.



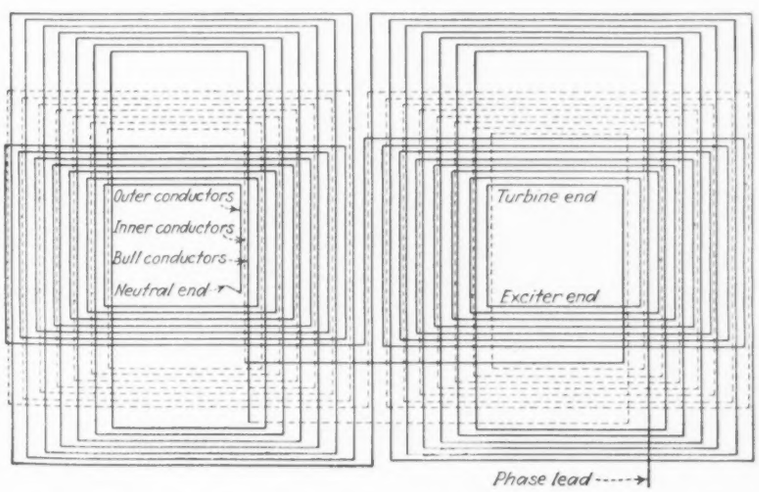
Conductor Bars Resemble Ordinary Concentric Cable

(a) Three conductors per slot. (b) Two-conductor design. Insulation is micanite.

The concentric conductor, which is the basis of the high-voltage generator design, appears to afford a simple solution of the problem. By its use an alternator can be so wound as to distribute the dielectric stress and lower its mean value at that part of the machine where there is limited area, and the maximum of heat generation at the regions adjacent to the stator bore. In the designs of alternators for voltages of 33 kv. and 44 kv. between phases there is sufficient margin to permit insulated conductor bars to be used with thicknesses of insulation not exceeding those of which experience has proved satisfactory. There are three conductors per slot, nested one within the other, the conductors being wound in such a manner that the voltage is gradually stepped down from the innermost conductor. This formation of conductor is also very strong mechanically—a distinct advantage where the conductor projects beyond the stator core for coupling to the end connections. For ease in description, the respective conductors in each slot are referred to as the "bull," "inner" and "outer."

The "bull" conductors of each phase are connected in series and finally connected to the "outer" conductors, which are starred to the ends of corresponding conductors of the remaining two phases, and then connected to earth. The "bull" conductor potentials range from 19,080 volts to 13,000 volts, the "inners" from 13,000 volts to 6,500 volts and the "outers" from 6,500 volts to zero. It is clear that with such a design there is a substantially constant potential difference of 6,500 volts between the conductors in any one slot and a maximum voltage from the conductor to earth of 6,500 volts. Such voltages are moderate and are readily dealt with.

The conductors are arranged in three rows, such an arrangement being found specially suitable for a high-tension machine. By staggering the conductor slots the flux density in the stator teeth is kept uniform, and it was found possible with this design, instead of providing an elongated conductor, as for a low-voltage machine, to use the round form above described and, at the same time, obtain increased internal reactance. By adopting this arrangement it is not necessary to bend the core

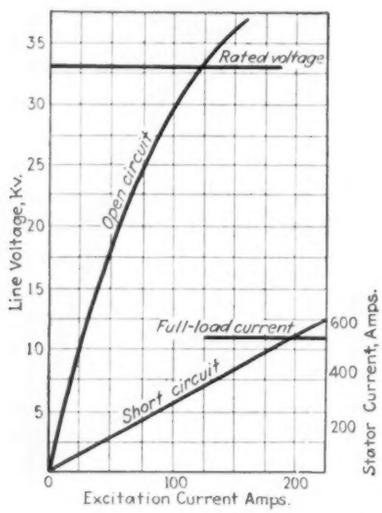


Stator Winding Diagram (One Phase Only) of a 3-Phase, 2-Pole Winding with 90 Slots and 264 Conductors, 3-Core Concentric Construction

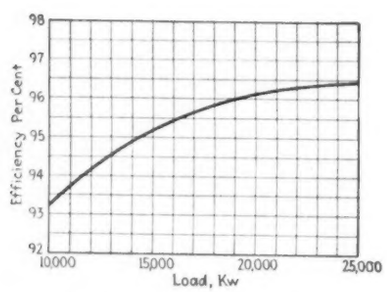
The winding of each phase has 88 conductors distributed between 30 slots, the voltage generated per conductor being 217. The phase voltage and the maximum voltage to earth is 19,080.

conductors where they project from the stator, in order to provide a reasonable leakage gap between the end windings and the rotor end caps. The staggering of the slots gives a uniform distribution of winding, and in effect has the advantages of the smooth-core armature, without the disadvantages of an unduly increased air gap. The excitation energy is therefore retained at a very reasonable figure.

The conductors of the highest potential are not carried to the slots adjacent to another phase. This increases the distance between regions of maximum potential, and so minimizes the electrical stresses. This reduces to 28,000 volts the voltage between adjacent conductors projecting from the core. The end windings illustrated are composed of flat copper strip formed on edge and having a full radius on the edges. This formation gives a very rigid construction, enabling it to withstand the stresses set up on short circuit. Additional mechanical support is given to the end-winding strips by fitting them into recesses formed in the impregnated-wood supporting clamps.



Actual Open-Circuit and Short-Circuit Characteristics



Efficiency Curve for 25,000-Kw., 33,000-Volt Alternator

There are three banks of end connections in each phase, corresponding to the "bull," "inner" and "outer" conductors. The cross-connections between each bank are provided with removable links to enable each third of the phase to be pressure-tested separately. The link forms a ready means to fit between-turns protection if desired.

Ample distance is provided between phases, so that it is unnecessary to provide insulating shields between the end windings, and adequate leakage surface is also provided over the impregnated-wood packings between the phases. The maximum potential difference in the end windings between the adjacent conductor in any phase and in another phase is only 23,000 volts.

Operating Data for First Installation

A 25,000-kw., 31,250-kva., 33,000-volt., 3,000 r.p.m. alternator incorporating these principles was built for the North Metropolitan Electric Power Supply Company, Ltd., for installation in its new power station at Brimsdown, North London, England.

Table II—Average Dielectric Loss in the Bar

Test Conditions	Voltage		Bar Temperature 20 Deg. C.	60 Deg. C.	110 Deg. C.
33 kv. on "Bull"	174 per cent	Dielectric loss, watts	30	105	235
22 kv. on "Inner"					
11 kv. on "Outer"		Leakage current, amp	0.008	0.016	0.03
19 kv. on "Bull"	Normal	Dielectric loss, watts	14	18.8	61
12.8 kv. on "Inner"					
6.4 kv. on "Outer"		Leakage current, amp	0.001	0.004	0.008

Any departure from accepted design, however small, can only be accomplished successfully after extensive research. This is particularly so in large electrical apparatus, where, in addition, the proof of actual operation must be applied. A few of the tests previous to and during the assembly of the alternator are outlined:

Stator Tooth-Heating Test—A section of the core plate was assembled and wound with a temporary winding in order to check the local heating which might result from the staggered disposition of the stator slots. The temperatures did not exceed those of an alternator of low voltage.

Pressure-Testing Apparatus—A single-phase transformer with a voltage ratio of 440/110,000 was used for all pressure tests. Tappings were brought out at one-third and two-thirds of the maximum voltage. In order to overcome the liability to flash over at the pressure test of 100,000 volts individual bars while under test were immersed in a bath of varnish. Test conductor bars were constructed, one set being unimpregnated and a second set being impregnated after the application of each insulating tube. The latter bars had 30 per cent lower dielectric loss.

Pressure Tests—On the completion of the winding the following pressure tests were applied: "Bulls," 67 kv. between phase terminals and to earth. "Inners," 45 kv. between phase terminals and to earth. "Outers," 23 kv. between phase terminals and to earth.

Testing Arrangements—The alternator was erected in the shops on a specially designed test bed. It was driven from an 800-kw. steam turbine and coupled in parallel with a 750-kw. d.-c. motor driving through gearing. Either machine was capable of driving the alternator at full speed when fully excited. A completely inclosed air system, with a fan delivering 40,000 cu.ft. of air per minute and surface air cooler, was provided for cooling the alternator. Temporary air ducts were constructed to recirculate the air. The excitation was provided by a d.-c. generator.

Wave Form—The voltage wave form between phase terminals and between phase terminals and earth departs less than 1 per cent from a pure sine wave and is free from ripples; no difficulty due to harmonics when operating on a cable network has been experienced.

Sudden Short-Circuit Test—The alternator was suddenly short circuited by an ironclad, oil-immersed switch. It should be recorded that after the test the end windings showed no sign of movement.

Table III—Forces on End Windings of 11-Kv. and 33-Kv. Alternators

	25,000-Kw. Alternators 11,000 Volts	33,000 Volts
Inherent reactance of alternator (per cent)	12.5	21.0
Reactance of transformer (per cent)	8.5	.....
Total reactance (per cent)	21.0	21.0
Current on short circuit (times full-load current)	4.75	4.75
Forces in Windings:		
(a) End connections between phases (lb. per foot-run)	75.0	17.5
(b) End connections between turns (lb. per foot-run)	14.0	2.0
(c) Between core conductors (lb. per foot-run)	250.0	140.0

Heat Runs—As it was impracticable to dissipate 25,000 kw. at 33 kv., the windings were rearranged so as to circulate current, i.e., with the three sections of each phase in parallel. The difference in voltage between the "bull" section and the two other sections causes a circulating current which is controlled by a choke in the circuit. While the conditions do not represent the actual conditions of operation, they give a very good indication of the results to be expected on load. The temperature rises were moderate and very satisfactory, the figures on load being well within the estimated values. During the open-circuit tests a record of the leakage current per phase was taken. This figure was 80 milliamperes at 33 kv. at 60 deg. C.

Efficiency—The efficiency of the alternator is shown in the accompanying curve. The efficiency is high at all loads, in spite of the restrictions imposed on the design owing to the fact that the machine had to be interchangeable as a whole with the low-voltage alternator.

Reactance and Mechanical Stresses on Sudden Short Circuit—The reactance of the high-voltage alternator proved on test to be approximately equal to the combined reactance of an alternator of normal design and a step-up transformer. The actual value obtained by calculation is 22 per cent, and that from the short-circuit tests is 21 per cent.

Conclusion

Since the plant was installed in August, 1928, it has operated continuously up to its maximum load at voltages varying between 34,000 and 35,000, and it has withstood without any sign of distress the most severe faults on the large overhead and underground network to which it is coupled. The control and regulation have proved eminently satisfactory in every way.

Applicable to Other Apparatus

Only the fringe of the possibilities has been touched, for while this discussion is confined to generation at higher voltages, other units of ever-increasing size, such as motors, motor-generators, synchronous condensers, etc., may be economically designed and coupled direct to the network without the use of transformers.

Charles L. Edgar Says:

"I HAVE come to look upon the electrical contractor as the ambassador of the electrical industry, the representative of our business who goes forth establishing relations where none existed . . . blazing the trail for things electrical."

"The average contractor can enter into promotional activity only in a limited way and sometimes not at all . . . the pioneering work and building up of business must be assumed by those in the industry better equipped to do the job."

"More outlets for the contractor mean more inlets for us."

"We believe that the friendship of the contractor is an asset of immense value, and we prize it highly."

"The best public service can come only from a united industry."

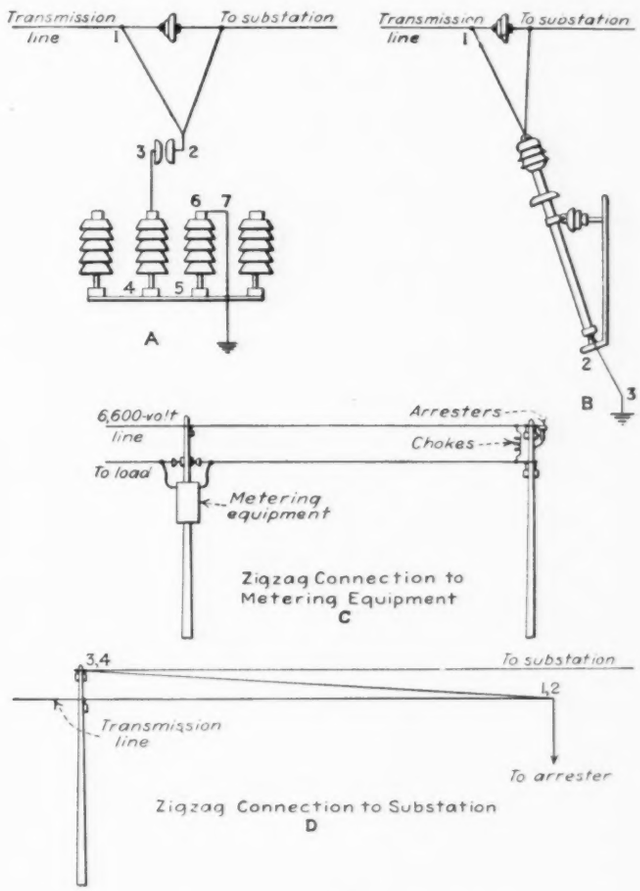
From an address before the Association of Electragists International, by Charles L. Edgar, *president Edison Electric Illuminating Company of Boston.*

Unshackling the Lightning Arrester

By B. E. Ellsworth

Engineer Iowa-Nebraska Light & Power Company, Lincoln, Neb.

THE entire elimination of lightning troubles is apparently the result of a scheme of arrester connection now in use by the Iowa-Nebraska Light & Power Company, which operates approximately 1,800 miles of transmission line and serves 200 towns and villages in the Middle West. Lightning conditions in this territory are bad, being surpassed only by those in several of the Southern states and in the Colorado mountains. Summer showers are frequent and each one is attended with severe lightning.



Zigzag Connection Permits Lightning Arresters to Function

Up until the last three years lightning caused much trouble. Burned-out transformers, metering equipments and shattered insulators and bushings were everyday occurrences. All grounds were tested and the resistance was found to be less than 1 ohm in some of the substations where lightning gave the most trouble, so that some other cause was sought to remedy matters.

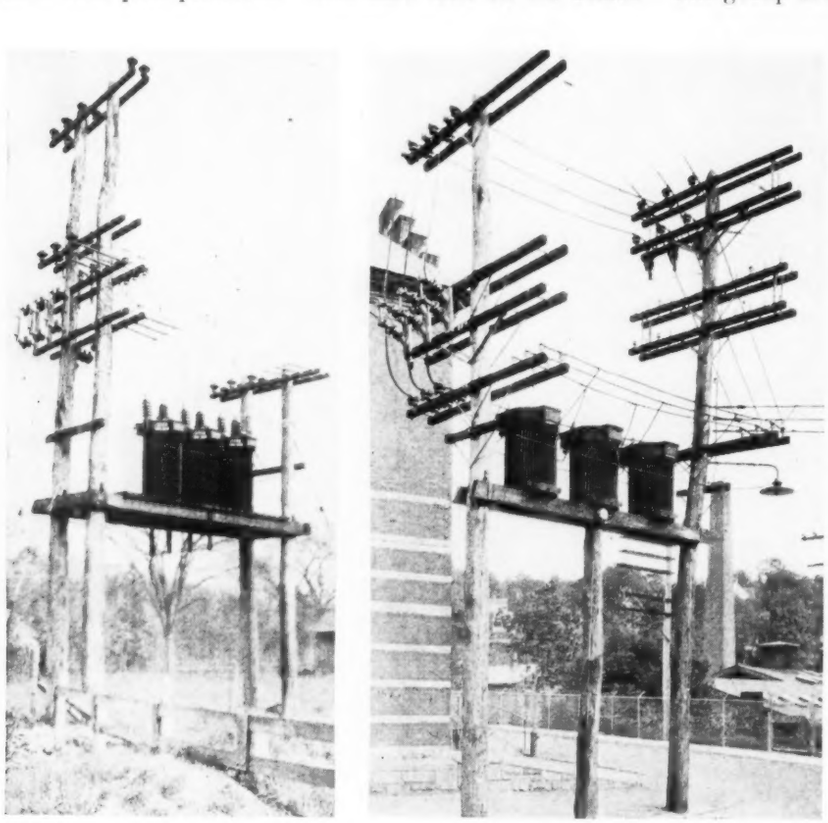
Sketches *A* and *B* show two typical arrester connections. Count the number of right angles the lightning has to travel in passing from the line conductor to ground; in passing through the first arrester there are

seven and through the second arrester three right-angled turns. Is it any wonder that better protection is secured from the second arrester arrangement?

At certain locations metering equipments and transformer bushings were lost with such regularity that something had to be done, and the result was a zigzag arrester connection as shown in sketches *C* and *D*. Lightning, in order to get to the substation or metering equipment, has to pass to the arresters and then one or two spans in the reverse direction. This zigzag connection is equivalent to four right-angled turns and the strange part about the arrangement is that it works. If four right-angled turns will eliminate practically all "follow through" of the lightning, then what should be expected of seven right-angled turns in the arrester circuit, as shown in sketch *A*? All principal metering equipments installed are connected with the zigzag connection, which has eliminated all lightning trouble with the exception of one substation. At this point the lightning damage has been reduced to less than half by its installation.

Compact Transformer Platforms

A RURAL community is served from a 27,600-volt line by the Connecticut Light & Power Company by means of three 50-kva. 27,600/2,300-volt transformers on a four-pole platform. The dead load on the beams is met by the four trusses, designed for an ultimate installation of three 100-kva. transformers. Another view shows an industrial substation consisting of three 75-kva., 13,800/460-volt transformers on a two-pole structure with short pole for middle reinforcement. The ultimate capacity is three 75 kva. and for three 25-kva. transformers the center support is eliminated.



Rural (300 Kva.) and Industrial (225 Kva.) Substations

Pros and Cons of Outdoor Metering

Arguments for and against are hard to evaluate in economic terms for decision must depend on local conditions

By R. G. Kloeffler
Professor of Electrical Engineering
Kansas State Agricultural College, Manhattan, Kan.

OF THE 400,000 residential meters installed at various places in the states of Nebraska, Kansas, Missouri, Oklahoma, Texas and Colorado, approximately 50 per cent are located on a back or a front porch. This information comes from 35 replies to letters sent out to central stations by the author in the effort to arrive at an economic evaluation of outdoor metering and a determination of its merits as an operating practice. It seems that outdoor metering in the sense of placing the meter on the back porch has become almost an institution throughout these midwestern states and with one or two exceptions all of the public utlilities in this group are definitely in favor of this form of metering. By far the greater number of such outdoor installations are made by simply placing an ordinary type meter on the wall of the house under the roof of the porch. Some use is made of home-made wooden boxes and of metal inclosures furnished by manufacturers. There are also a number of experimental installations of the recently developed outdoor type meter. But these installations, requiring special equipment or treatment, are greatly in the minority.

From the 35 replies are assembled ten advantages of outdoor metering and six disadvantages. The advantages are: (1) Meters can be read easily and the time of the meter reader is saved; (2) meters can be tested easily and the time of the meter tester is saved; (3) saves time of installation crew on disconnects and new installations; (4) meter readers and testers do not annoy the customer; (5) reduces the likelihood of the theft of electric current; (6) eliminates the return calls of meter readers and testers; (7) meter men and meter readers will not be exposed to or contract contagious diseases; (8) meters will not be located in dark and dirty places; (9) meter readers and testers cannot be accused of theft of property from customers' premises; (10) reduction in the fire hazard attending meter installation upon the customers' premises.

The disadvantages as brought out by the letters are: (1) Meters must be tested under adverse weather conditions; (2) screws, wing nuts and cases of meters corrode rapidly; (3) loss of personal contact between the public utility and the customer; (4) meters subject to exterior weather conditions will not be so accurate; (5) meters

are more subject to physical damage; (6) a technical question in regard to the proper location of the entrance switch and fuses is raised.

Economic Value of Outdoor Metering

Any attempt to place a money value on outdoor metering must of necessity be based on a large number of assumptions and speculations because the actual conditions will vary in different states and in different cities in the same states. The data that have been submitted in reply to the author's question show that the call-backs of meter readers amount to about 5 per cent on the basis of the total number of meters. Since 50 per cent of all meters reported are already outdoors the correct value of the per cent of call-backs for indoor meters should be 10 per cent. When the meter reader goes out to make call-backs, since it is some distance between stops, it is probable that he will have to travel by company car, and the data which are submitted show the cost of each call-back is about 10 cents each. Thus for a 10 per cent call-back with a 10 cent cost for each one it would follow that the cost of call-backs per residential customer would average 1 cent per month, or 12 cents per customer per year.

Meter Box Set Flush in Wall of the House

Similar data collected for the call-backs of the meter tester show that the additional cost over a first call is about 20 cents each, and assuming the same percentage of call-backs, namely, 10 per cent, it follows that the outdoor meters would save about 1 cent per customer per year through elimination of call-backs for meter testing.

The data submitted show that the average cost of reading meters is a little over 2 cents. The author is venturing the guess that the meter reader could save one-fourth of his time if he did not have to wait for a customer to come to the door and if he did not engage in some conversation with the customer, such as passing the time of day and remarking about the weather. If this assumption is correct an outdoor meter would save about ½ cent per customer per month, or 6 cents per customer per year.

It is agreed that the use of the outdoor meter practically eliminates the theft of electric current. While there are no data available as to the amount of current stolen annually, it would probably be safe to estimate that it comes to one-quarter of 1 per cent of all current consumed. This amounts to 9 cents per residential customer per year on the basis of monthly bills of $3.

The gross saving produced by the meter outdoors thus amounts to 28 cents per year per residential customer. This saving presupposes the use of a meter that is compensated for temperature variation. The total of 28 cents per year would justify an investment of $1.87 for additional equipment above that required for indoor metering if fixed costs are figured on a basis of 15 per cent. However, if one considers that the older types of meters which run slow in the winter time are used there will have to be a material reduction from the gross saving of the outdoor installation on account of the decreased revenue through the colder seasons of the year.

The foregoing discussion, with all of its assumptions and speculations, indicates that from the economic standpoint there is small advantage in favor of outdoor metering. Moreover, the discussion did not take into account, except incidentally and to its partial justification, the additional cost of outdoor metering equipment. Neither did it take into account the increased depreciation of equipment placed outdoors, but these considerations, as well as the others that were earlier treated in greater detail, are susceptible of any kind of presentation that coincides with the ideas of the person making it.

An exercise for the analytic logician might be the balancing of the advantages of outdoor metering against its disadvantages by pairing them off. For instance, it would seem that elimination of the inconvenience to the customer in having to open doors for meter readers and testers might just about balance the value of the personal contact between the public utility and the consumers. The reduction in theft of electric current might be offset by the fact that outdoor metering equipment is more subject to physical damage. The fact that meters are more readily accessible to meter readers and testers might be held to balance the necessity for the meter man testing outdoors under adverse weather conditions.

The arguments adduced in this article appear to be about balanced in favor of and against outdoor metering. To be set over against the actual or apparent cogency of the arguments against is the existing condition of 200,000 out of 400,000 meters being outdoors in the states from which replies were received to the questions of the author. It would seem that the idea of outdoor metering is gaining ground. The reason for this state of affairs is, of course, that the advantages of outdoor metering in locations where it is practicable must outweigh its disadvantages.

Comparisons between the two manners of metering should not be made on the basis of a general question of outdoor versus indoor metering. The decision in favor of the one or the other must rest entirely upon specific local conditions.

The Engineer's Responsibility

By L. B. Andrus

President Indiana Electric Corporation

The utility engineer of today must be able to transfer his thoughts to the ultimate purposes and requirements of his work even though its purposes involve conditions with which he is not in actual contact in the utility organization's every-day operations and over which he does not exercise direct supervision or control.

Excavating for a Manhole in a Wet Place Near Wesley Lake

Fighting Ocean, Lake and S

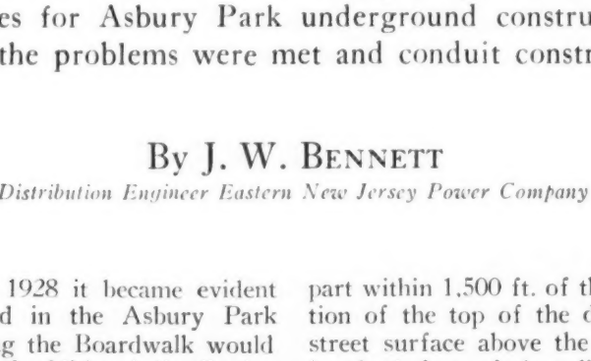
Below-water-level ducts with sandy soil present unusual features for Asbury Park underground construction. How the problems were met and conduit constructed

By J. W. BENNETT

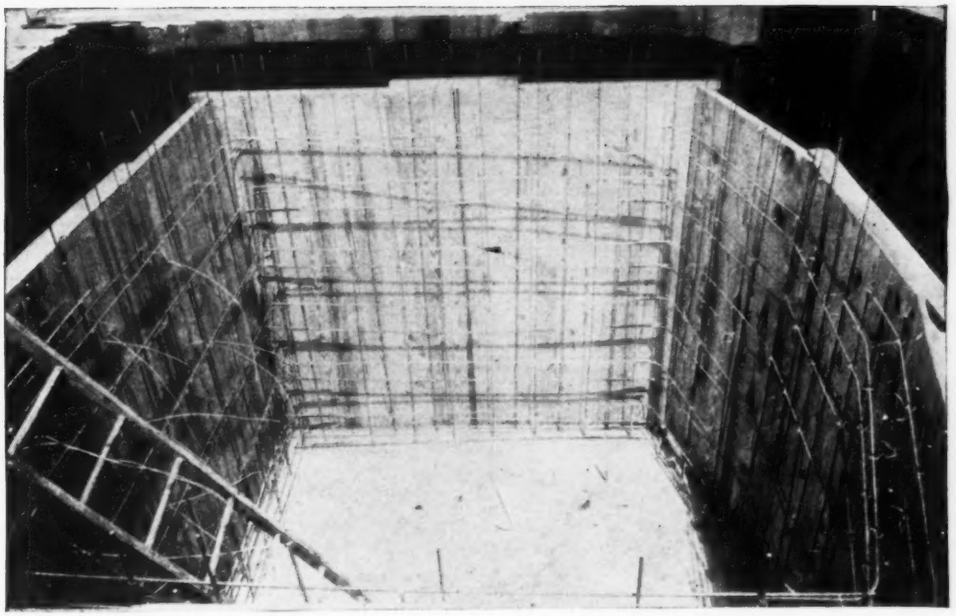
Distribution Engineer Eastern New Jersey Power Company

DURING the summer of 1928 it became evident that the increase in load in the Asbury Park business section and along the Boardwalk would make necessary the installation of additional distribution feeders before the summer of 1930. The causes of this increase were twofold: First, the regular yearly increase due to normal building operations and the increased use of electrical equipment; second, the construction of two large public buildings, the new casino and the convention hall and theater, on the boardwalk. In order to provide facilities for the installation of these feeders and also to care for future growth it was decided to proceed immediately with the construction of underground conduit lines from the Allenhurst power plant to the areas above mentioned. Asbury Park, in common with most resort cities of its type, has its greatest load during the summer months, the peak usually occurring just before Labor Day.

The entire conduit system is being installed within 4,000 ft. of the Atlantic Ocean and a considerable part within 1,500 ft. of the ocean. The maximum elevation of the top of the duct line is 17.4 ft. and of the street surface above the duct line 20 ft. Twenty-four hundred feet of duct line on Lake Avenue is within 20 ft. of the edge of Wesley Lake, the greater part of this run is below the level of the lake and the bottoms of several of the manholes are below the lake bottom. No less than fourteen manholes have already been constructed in locations where their floors are below sea level. The greater part of the system is constructed in sandy soil, necessitating bracing of trenches, in a number of places, and permitting seepage of water wherever the ground is low or wet. Part of the excavation was through what had evidently been a swamp at some previous time. In this section several old tree stumps and in two or three cases parts of an old wooden bulkhead were removed from the excavation. Near the bottom of several manhole excavations semi-liquid soil was



Scrap Trolley Rails Used to Reinforce Brick Manholes



Outside Forms and Reinforcing for Transformer Vault

Swamp to Go Underground

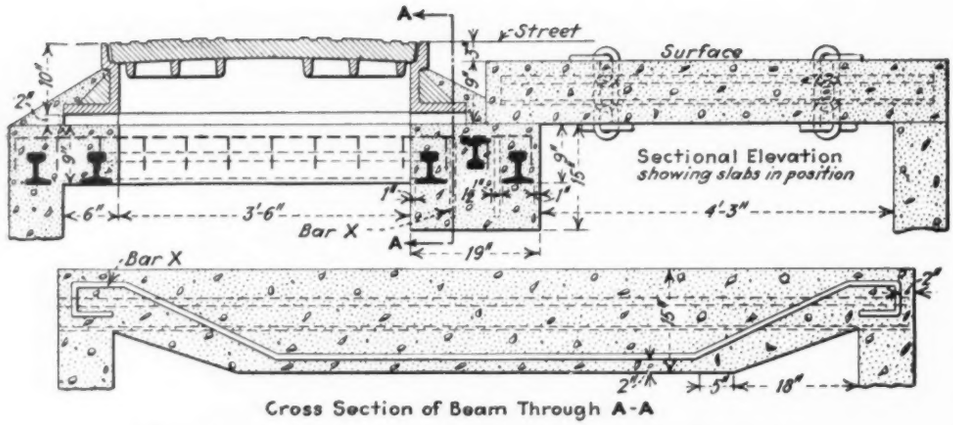
encountered. This condition was due to a continuous seepage of water through the soil. In a number of cases springs were encountered in the bottom of excavations and in numerous cases it was necessary to lay tarpaper on the bottom and pour the concrete base of the manhole on top of this to prevent the concrete mixing with the muck. The accompanying pictures illustrate the conditions that were encountered in excavating for manholes and duct lines in various locations.

Two materials have been used for manholes. In the higher, well-drained locations brick was used for the side walls with mass concrete bottoms and reinforced concrete tops. At street intersections and in other locations where there are, or are likely to be, branch lines in two or more directions octagonal manholes measuring 8 ft.x8 ft.x6 ft. (inside dimensions) are used. At points between intersections 4-ft.x4-ft.x5-ft. square manholes are installed; these are located opposite property lines and are usually placed midway between the regular 8-ft.x8-ft. manholes. The brick manholes are built as follows: An 8 in. or 9 in. thick concrete bottom, using a mixture of one part Portland cement, three parts washed sand and five parts of $\frac{3}{8}$-in. to $\frac{1}{2}$-in. gravel, having outside to outside dimension 18 in. greater than the outside face-to-face measurements of the walls, is laid in the bottom of the excavation. An 8-in. brick wall consisting of run-of-kiln updraft brick laid in a 1:3 cement mortar is built up to the required height above this bottom. The top consists of an 8-in. slab of heavily reinforced concrete using a 1:2:4 mixture. The richer mixture was adopted for the top on account of the vibration due to street traffic. Reinforcing for the top consists of 60- to 70- lb. scrap trolley rails placed 10 in. on center. Brick placed between the webs of the rails with ends resting on the lower flange permitted pouring the top slab without the use of any forms except the one for the circular manhole opening.

Excavating a Deep Trench in a Comparatively Dry Location

In sections where water conditions are especially bad, as along Lake Avenue, and in sections close to the ocean it was decided to make both manholes and conduit line as near watertight as practicable. With this end in view a study was made of various types of waterproof manholes and we came to the conclusion that waterproof concrete construction was the answer in our particular case.

Where this type of construction is necessary reinforced concrete manholes, having the same inside dimensions as the brick above mentioned, are used. The octag-



Details of Transformer Vault Top Construction

onal shape is particularily adapted to locations where conduits branch two or more ways from the main line, since it permits the handling and racking of cables with the minimum of bending, at the same time giving ample working space in the center of the manhole. With concrete construction, and in locations where it is necessary to construct a cofferdam, this shape has the further advantage that both cofferdam and forms are practically self-supporting.

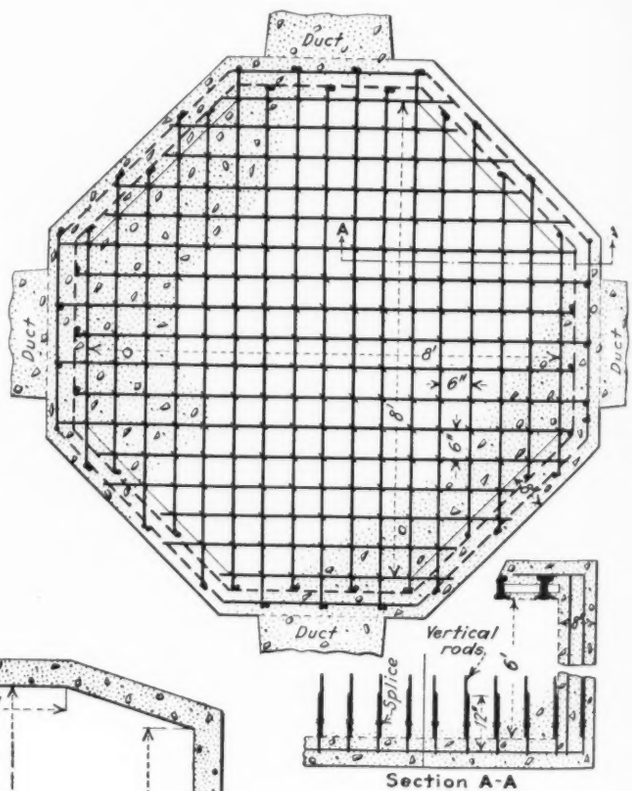
In building a watertight concrete structure a good mixture—that is, one in which high quality ingredients, properly combined, are used—is the most important consideration. One of the best methods of securing the desired results is to increase the proportion of cement in the mixture. This will aid in reducing the size of the voids in the finished structure and consequently the chances of water seeping through. By the addition of a suitable waterproofing compound these voids may be still further reduced and the denseness of the concrete further increased. The result is an almost perfect job of waterproofing.

A mixture consisting of one part waterproof Portland cement, two parts of clean, sharp sand and four parts of $\frac{3}{8}$-in. washed gravel was first tried. Results obtained with this mixture were, on the whole, satisfactory, though some difficulty was experienced due to slow setting of the concrete. At the same time some experiments were made with a mixture consisting of one part of common Portland cement, two parts of sand and four parts of gravel, with the addition of one quart of a liquid waterproofing compound per bag of cement. We found that by means of the latter method we could obtain a rapidly setting concrete that was entirely satisfactory, and this method has been adopted for all of the more recently constructed manholes.

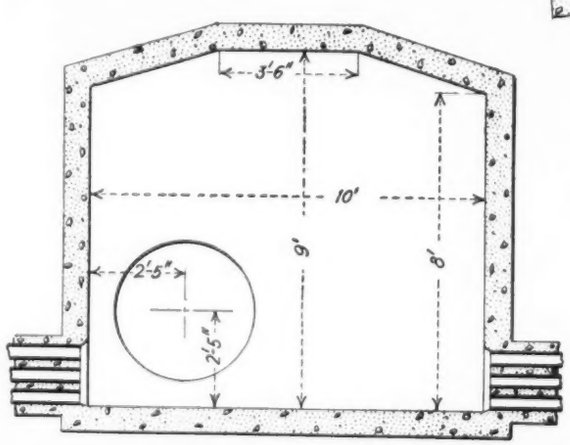
To lessen cracking of the walls under variations in temperature and to increase the strength of the finished structure the sides and bottom of all manholes are reinforced with $\frac{3}{8}$-in. deformed reinforcing rods.

Accompanying figures illustrate the various steps in the construction of a reinforced concrete manhole and show details of the reinforcing used in sides and bottom. After the side walls have set for 48 hours or longer the rails and brick for the top are placed and the ends of the rods in the walls are bent in at right angles to the walls, and when the top slab is poured we have, in effect, a one-piece reinforced concrete structure. After the top has set sufficiently the outside forms and cofferdam are removed and the excavation backfilled.

The type of transformer manhole being used is 10 ft. in length, 9 ft. wide at its widest part and averages 8 ft. in depth, all inside measurements. All of these manholes are being built of reinforced concrete and are designed to accommodate transformers up to 300 kva., three phase, 2,300/4,000 volts primary. The top of the vault is built in two sections, a fixed section and a removable section. A standard 42-in. circular manhole opening is provided in the fixed section for entrance to the vault and to



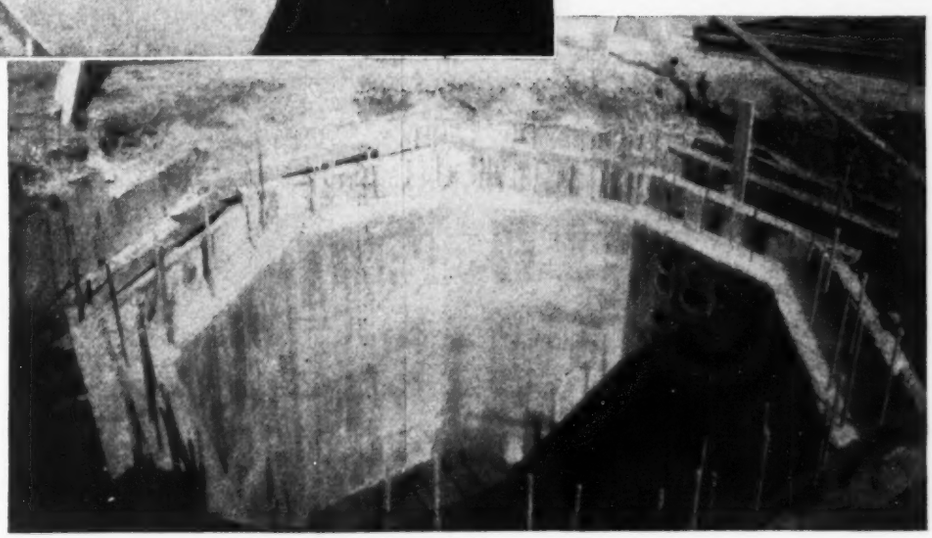
Plan and Elevation of Reinforcing in a Four-Way Manhole



Plan of a Transformer Vault

permit the entrance of apparatus, such as sectionalizing boxes, network protectors, etc.; this opening is large enough to permit the entrance of any single-phase transformer that is likely to be installed. The removable top is built of heavily reinforced concrete and is a part of the concrete base of the street, removable expansion joints being installed to make a tight joint and permit the ready removal of the top. Ventilation is obtained through two 8-in.x13-in. air ducts, installed one near the top and one near the bottom of the vault. They run to a convenient point back of the curb, usually the building line, where a suitable ventilator is installed.

Four-inch fiber conduit, with sleeve joints, incased in concrete, is being used for all duct runs. Ducts are laid with a minimum distance of 30 in. between the finished street surface and the top of the row of ducts, where this is practicable. A minimum of 1 in. of concrete between adjacent conduits and a 3-in. concrete envelope on sides, top and bottom of the conduit bank is maintained throughout. Where it is impractical to obtain 30 in. of cover, due to the presence of subsurface obstructions, the spacing of conduits is increased to 2 in. and the envelope to 4 in., for additional strength and protection to the ducts. A 1:3:5 concrete mixture is used for the duct runs in most cases.

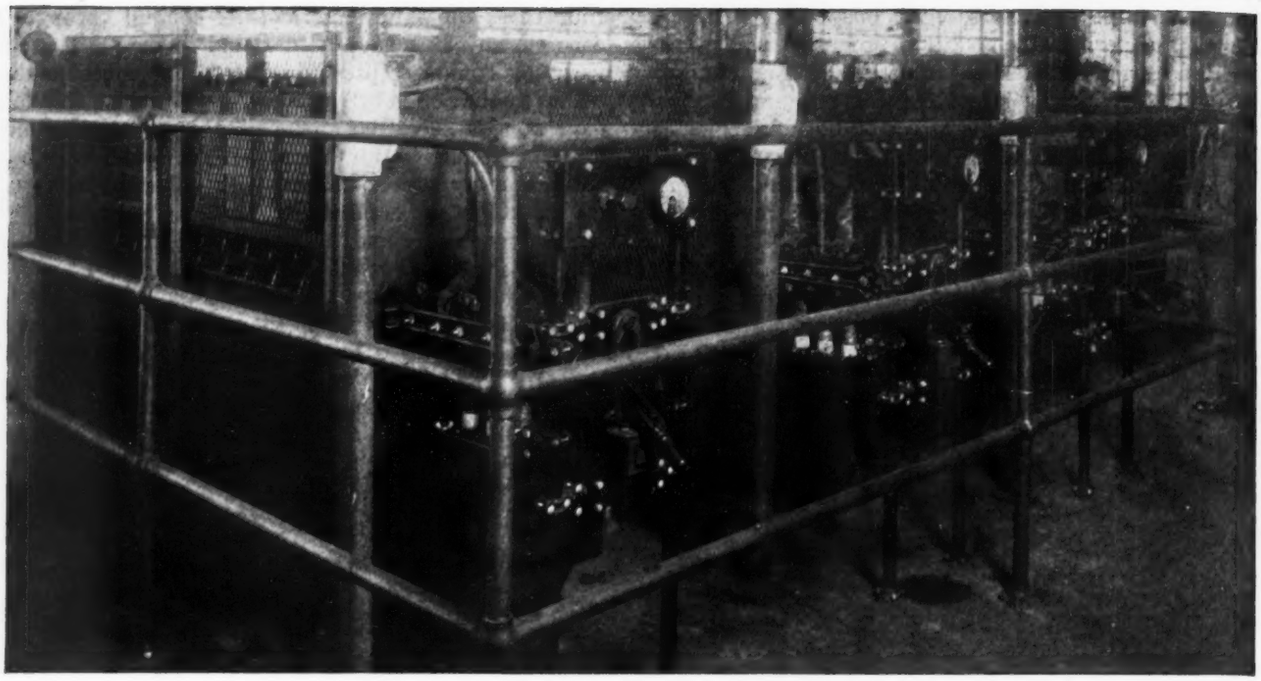


Sides and Bottom of Concrete Manholes Reinforced with 3/8-In. Deformed Rods

Where water conditions are especially bad a waterproof concrete mixture is used for the duct line as well as for the manholes. In these cases the standard mixture employed for manhole construction is used, and by taking care to get good bonds between adjacent sections of conduit run and between conduit and manholes a satisfactory waterproof job has been secured. Out of approximately 2,600 ft. of conduit line built in a section subject to the most severe water conditions only three or four cases of water entering the conduit through the concrete envelope have been found to date. These are very small and are probably due to imperfect bonds or cracks at the joints between two days' work. While we have not yet succeeded in building a watertight conduit line, the results so far are satisfactory, and we do not anticipate any serious trouble with water entering manholes through the conduit line.

Some engineers and operating men may question the wisdom of our practice of building waterproof manholes and conduit line on the ground that the benefits realized are not sufficient to warrant the extra cost of this work. Perhaps, in most cases, this would be true, but in our case it is not, for a number of reasons. It is impossible to drain a manhole, when its floor is not only several feet below the sewers but is also below sea level, without installing a complete drainage system with lift pumps and other apparatus to dispose of the water. If ordinary construction were used water would enter the manholes so rapidly, in many cases, that it would be out of the question to splice cables, test or install apparatus in a manhole without keeping a pump in operation almost continuously. Every time it became necessary to inspect any apparatus it would be necessary to clear the line of water before it would be possible to enter any of the manholes. In our case the savings in maintenance and operating costs will more than justify the additional cost of building a watertight job.

When load increases most properties face the necessity to go underground, but in few instances will terrain difficulties be encountered such as were found in Asbury Park. The system is installed within 1 mile of the Atlantic Ocean and within a few feet of Wesley Lake in part of the run. Combine this with sandy soil and a duct line below water level in some parts and it is readily understood that many problems had to be solved.



Factory Saves $1,000 Monthly

by Power-Factor Correction

Capacitors at strategic points reduce power cost to manufacturer and recover their cost in two years

By R. E. MARBURY
Supply Engineering Department
Westinghouse Electric & Manufacturing Company

A RECENT engineering analysis indicated that approximately 7,000,000 kva. of corrective equipment is needed in the United States at the present time to obtain a general power factor of 85 per cent everywhere. It was also found that approximately 20 per cent of this could be most effectively taken care of by capacitors.

One of the largest fields for power-factor correction by means of capacitors on the customer's premises is in the case of the food industry, which requires approximately 4,134,975 hp., and of this amount about 632,279 hp. is generated and 2,354,875 hp. is purchased electrical power. The average horsepower of motors in the food industry is 9.3. These relatively small motors result in a rather low operating power factor. Some correction may be made by means of synchronous motors, synchronous condensers, etc., but a very careful analysis indicates that a corrective kilovolt-ampere required which can be satisfactorily furnished by capacitors is 560,000. This would bring the average operating power factor up to 85 per cent. This correction, no doubt, would take the form of group capacitors in most cases. However, there would probably be many cases where capacitors of a smaller kilovolt-ampere rating would be installed on individual motors.

The Kellogg factory in Battle Creek, Mich., installed a number of capacitors totaling 1,860 kva. and raised the power factor to approximately 100 per cent. For the month of October, 1928, the month before the installation of these capacitors, the power rates were as shown in the following:

Kilowatt demand charge $33 per kw. per year for the first 200 kw. and $22 per kw. per year for the next 2,800 kw.; energy charge, 1.1 cents per kw.-hr. for the first 150 kw.-hr. per month per kilowatt demand, 1 cent per kw.-hr. for the next 150 kw.-hr. per month per kilowatt

demand and 0.8 cent per kw.-hr. for all over 300 kw.-hr. per kilowatt demand.

On the above basis and with a kilowatt demand of 2,424 kw. and an energy consumption of 938,400 kw.-hr., the customer's power bill was $13,952.75. After the installation of the capacitors mentioned above the power company gave the customer a new rate, as follows:

Kilowatt demand charge $26.40 per kilovolt-ampere per year for first 200 kva. and $17.60 per kilovolt-ampere per year for the next 2,800 kva.; energy charge 1.1 cents per kilowatt-hour for first 120 kw.-hr. per month per kilovolt-ampere demand, 1 cent per kilowatt-hour for next 120 kw.-hr. per month per kilovolt-ampere demand and 0.8 cent per kilowatt-hour for all over 240 kw.-hr. per month per kilovolt-ampere demand.

On this basis the customer's kilovolt-ampere demand, after the installation of the capacitors, was 2,400 kva. and the energy taken has been taken at the original figure of 938,400 kw.-hr. for comparison. The bill on the new basis was $12,613, giving a saving of approximately $1,339.75 per month, or $16,000 per year. The first cost will be recovered in about two years on this basis.

Three 300-kva. capacitor banks, each with a circuit breaker and an ammeter panel for measuring the current taken in any one of the three phases, are shown in the accompanying illustration on page 942. Another installation of a 300-kva. bank at the Kellogg plant, two 300-kva. banks and one 60-kva. bank located at other points in the plant comprise a total kilovolt-ampere of 1,860.

Each capacitor frame supports a number of 5-kva., 440-volt, single-phase units connected in delta. These units are the oil-impregnated type and are approximately 14 in. x 14 in. x 6 in. thick. The insulators are the same as used on 2,300-volt equipment.

When the capacitor is disconnected from the line there is the possibility of storing a charge which would be dangerous to an operator unless it is eliminated automatically in some way. It was once the practice to install resistors permanently on the capacitor, which would act as a discharge device when the circuit breaker is opened.

The capacitors shown in the accompanying illustration are provided with instrument transformers connected permanently across each phase. These transformers serve as a positive discharge after the circuit breaker is opened and, furthermore, they may be used for metering purposes or for an indicator if desired.

Only a few years ago it would have been necessary to install a power transformer in the above installation to step up 440 volts to 2,300 volts for connection to a 2,300-volt capacitor. This would have involved the transformer losses, which are several per cent, and the additional floor space. The size of the capacitor described above is the same size as would have been used for 2,300 volts in the case of the transformer-connected outfit. The space formerly taken up by the transformer is now saved on the present basis. In addition, the Underwriters recommend that transformers be installed in concrete vaults, whereas in the case of capacitors made up of units, each unit not using more than 3 gal. of oil, which is the case with the above capacitors, it is not necessary to provide such a vault.

Corrective equipment is available for any voltage at present from 220 to 5,000 volts without the use of transformers. It is obvious that the conditions existing at the Kellogg plant were not exceptional, and that there are many places where power-factor correction could be made, either by means of capacitors or other corrective equipment, or a combination of both, where the saving would be great. The rates offered by this power company are not unusual. Such rates exist in many parts of the country.

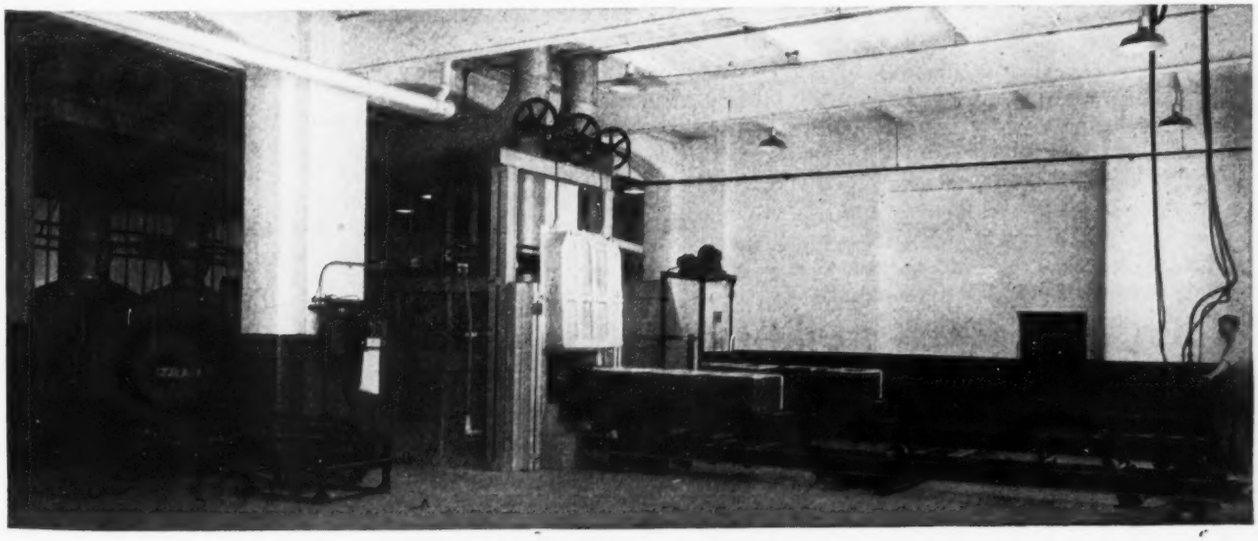
Vitreous Enameling in Electric Box-Type Furnace

THE following sample computation for vitreous enameling of sheet steel in an electrically heated furnace was recently offered by R. M. Cherry* of the industrial heating and welding department of the General Electric Company at the Industrial Electric Heating School in Cleveland:

Assume an enameling plant having a production of 10,000 sq.ft. of 20 gage sheet steel (1½ lb. per square foot) to be enameled single coat per 24 hours, at a temperature of 1,550 deg. F. and fifteen charges per hour.

The loading efficiency of a box type furnace is approximately

**As indicated in a paper, "Calculation and Operating Costs of Electric Furnaces," presented by R. M. Cherry of the General Electric Company at the Industrial Electric Heating School, Case School of Applied Science, Cleveland, Ohio.*



Enameling Furnace for Refrigerators

260-kw., three-phase furnace, 12x4 ft. drier, conveyor and fork shown at position of discharge

70 per cent; that is, in a furnace of 100 sq.ft. loading area we can expect to charge 70 sq.ft. of miscellaneous size sheets.

Therefore, $\frac{10{,}000}{24 \times 15} = 28$ sq.ft. or 42 lb.

to be loaded per charge.

28 ÷ 70 per cent = 40 sq.ft. = area of furnace required.

A furnace having dimensions of 4 ft. wide by 10 ft. long will meet the conditions.

Absorption of wares:

42 × 15 = 630 lb. of ware enameled per hour.

Substituting in the formula given above we have

$\frac{630 \times 0.15 \times 1{,}500}{3{,}412} = 42$ kw.-hr. per hour = absorption of ware.

Absorption of racks:

For this size furnace the weight of racks is assumed to be 130 lb. and that the temperature of the racks is raised an average of 425 deg. F. each charge.

$\frac{(130 \times 15) \times 0.14 \times 425 = 34}{3{,}412}$ kw.-hr. per hour = absorption of racks.

Standby Losses:

Inside area of furnace = 178 sq.ft.

$\frac{178 \times 1{,}550}{10{,}000} = 27$ kw.-hr. per hour = stand-by losses.

Open-Door Losses:

From test data, we know that the open-door losses are approximately 1 kw.-hr. each time the door is opened. For fifteen charges the door will be opened 30 times per hour. Therefore, the open-door losses equal 30 kw.-hr. per hour and they exceed the standby losses from walls and closed door.

SUMMARY OF HEAT REQUIREMENTS

Heat absorbed by ware = 42 kw.-hr. per hour.
Heat absorbed by racks = 34 kw.-hr. per hour.
Stand-by losses = 27 kw.-hr. per hour.
Open-door losses = 30 kw.-hr. per hour.
Total power consumption = 133 kw.-hr. per hour.

Net economy = $\frac{630 \text{ lb.}}{133} = 4.75$ lb. per kilowatt-hour.

The rating of the furnace should be at least 150 kw.

Letters from Our Readers

Short-Time Rating of Oil Breakers

To the Editor of the ELECTRICAL WORLD:

Emphasis on this subject, such as was made in your recent editorial, is indeed worth while and the three requirements covered in the first paragraph are correct. Attention to the short-time rating characteristic which is a function of the square of the current is particularly important. Emphasis should also be placed upon the first asymmetrical half cycle which produces the electromagnetic stresses on the breaker current-carrying parts, as this asymmetrical current may reach 75 per cent greater value than the normally expected symmetrical current, thereby producing stresses three times the value of the normal calculated value of symmetrical peak currents. Considerable attention has been given recently in breaker designs to protect against this abnormal condition, but there is still great room for improvement. Although high-voltage breakers are intrinsically of weaker mechanical construction, due to the necessity of providing clearances and long creepage distance over insulating materials, the currents are of considerably less magnitude than with a lower voltage breaker, and as the stresses are a squared function of the current, the resulting damages from electromagnetic stresses are not as pronounced.

The third requirement mentioned in the first paragraph of your editorial is a result of heating, which is a function of the square of current and time with a given cross-section and an inverse function of the mass to be heated with a given loss. This item is therefore a squared function of the current density of the current-carrying parts, and although there is a tendency in general design to have a lower current density in the high-voltage breakers, which would tend to make them less subject to heating limitations, this problem is apt to be present in breakers of all voltages if the short-circuit current is not quickly disconnected.

The combination of the last two functions is our usual source of trouble where the electromagnetic stresses reduce the contact area of the movable parts, thereby increasing the current density and resulting in heating damages to the breaker parts.

The calculation of momentary short-circuit currents as related to breaker ratings should not neglect the asymmetrical first cycle condition on stresses and greater attention should be given to the scientific analysis of the short-time rating, as well as the interrupting capacity of the breaker.

HARRY R. WOODROW,
Electrical Engineer.
Brooklyn Edison Company,
Brooklyn, N. Y.

Current-Carrying Capacity of Buses

To the Editor of the ELECTRICAL WORLD:

In the Oct. 19 issue of the ELECTRICAL WORLD S. W. Mauger points out that it might be possible for a reader of my Sept. 21 article on "Current-Carrying Capacity of Busbars" to get the impression that this method of handling large currents is entirely new. As mentioned by Mr. Mauger, it was not the intention to create this impression.

However, when it is considered that many requests are made for recommendations on busbars and in most cases the inquirer presupposes unlimited capacity by adding conductors, it was evident that existing available information was inadequate. For that reason I felt that the more generally sought information on busbars should be made accessible to as many as possible.

I regret that more of the available data on busbars, and particularly some of the special considerations, could not be covered in a short, concise article. It may be that some of this data would be found quite new.

H. W. PAPST,
Engineer Switchboard Engineering Department.
Westinghouse Electric & Manufacturing Company.

Public Relations Enhanced by Proper Clean-Up

To the Editor of the ELECTRICAL WORLD:

The editorial "Beware the After Costs" in the October 5 issue of the ELECTRICAL WORLD is excellent as far as it goes, but to the writer it seems to miss one of the most important features of a proper clean-up.

It is true that claims may arise because of the conditions, but that which is an absolute certainty is that if reasonable care is not taken to remove construction rubbish and repair construction damage the owner of the property nine times out of ten will be an active opponent of the company, and when later on maintenance or expansion necessitates further relations with him there arise costs in money and in good will far greater in the aggregate than the damage claims. *Per contra*, a little attention to making the right-of-way at least as good as before the work was done often brings unexpected and most valuable help from the land owner when new rights are desired.

CHARLES RUFUS HARTE,
Construction Engineer.
The Connecticut Company,
New Haven, Conn.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Hydro Plants Palu and Cavaglia.—W. RICKENBACH.—These two recently finished hydro-electric plants are situated in the southern part of Switzerland close to the Italian border, and utilize a total drop of 1,550 ft. in two stages, of the Puschlav River. Each station contains but one unit, 10,000 kva. in Palu and 7,800 kva. in Cavaglia. Operating in parallel, their output is joined by a 37-mile, 140-kv. transmission line with two other generating stations further north along the same river. Noteworthy is the unusual hydraulic arrangement in the Palu station. Operating under a head of 850 ft., the main vertical shaft generator is driven by a direct-connected four-nozzle Pelton wheel. A part of the discharge water of this wheel is directed into a 880-kva. horizontal Francis turbine, keyed to the same shaft as the Pelton wheel, but 90 ft. below it. Under normal conditions both wheels add their output, and the tailwater from the Francis wheel flows into a nearby storage lake. In addition, two 1,250-kw. motor pumps can deliver surplus water in this lake, acting as a hydraulic accumulator. The transmission line is made of Aldrey aluminum alloy.—*Bulletin de l'Association Suisse des Electriciens*, September 7, 1929.

Generation, Control, Switching and Protection

Tests on Burning Oil.—E. TEBBE and W. GROEZINGER.—In case of serious trouble on transformers or oil circuit breakers, a large amount of oil may be set on fire, causing damages far beyond the original electric failure. It is therefore of great importance to install oil-filled machines in such a manner as to provide a quick quenching of burning oil. The daily growing use of electric drives in coal mines, with transformers installed underground, calls for particular care in regard to fire danger from burning oil. The authors have carried out a series of tests, attempting to quench burning oil. Three hundred pounds of transformer oil, contained in a steel tank, were heated near the flame point, the oil was then ignited, and by tilting the tank the burning oil was poured out. Spreading the oil over a large cement floor did not cool it sufficiently to stop it from burning. Pouring it through a fine steel grate did not quench the flames. Catching the oil in a large funnel and carrying it away through a short pipe subdued the flames only if the pipe was completely oil filled. Diverting the oil into a ditch with flowing water covered the water with burning oil. The only way safely to quench the flames was found to be catching the oil into a pit, above which was placed a thick layer of small quartz pebbles, lying on a steel grating. This method is recommended for all installations, the pit to be deep enough to hold more than the oil content of the transformer. — *Elektrotechnische Zeitschrift*, September 26, 1929.

Transmission, Substations and Distribution

Time-Delay Fuses.—E. JUNK.—A new type of thermal cut-out or time-delayed fuse of exceedingly simple construction and of a size only a trifle larger than the customary fuse plug has been developed. Instead of the usual single narrow strip of fuse metal, this new fuse has several metallic paths in parallel. If an overload of more than momentary duration passes this fuse, heating will set in, which begins to restrict the path to fewer parallel conductors until finally the last one melts off, accomplishing the ultimate circuit opening. The exact functioning of the new fuse is shown in sketches and curves. Aside from this desirable time feature, the new cut-out has the added advantage of a much smaller ohmic resistance than the customary fuse, causing, therefore, considerably smaller watt losses. In large installations this may become an important factor. For example, 1,000 customary 20-amp. fuses represent under full load a loss of 6,080 watts or 12,160 kw.-hr. for 2,000 hours. The same number of new fuses have a combined loss of only 2,640 watts or 5,280 kw.-hr. for that period, or a saving of 6,880 kw.-hr.—*Elektrotechnische Zeitschrift*, September 19, 1929.

Motors and Control

Means to Improve Power Factor.—F. GRIEB.—Explaining the effect of phase displacement between current and voltage, the author points to the great interest of central stations in keeping this angle as small as possible. The various known methods of decreasing this angle on transmission and distributing systems are critically investigated. For large systems synchronous and asynchronous compensators are used extensively, but an analysis tends to show that the synchronous condenser is the more advantageous type. For distribution systems compensation is economical wtih generators, producing leading current at strategic points in the network. More general use of large squirrel-cage armature motors, static condensers or compensated asynchronous motors may also solve the problem economically. The writer believes that compensated motors require careful attention to perform reliably, and that therefore at present the other two methods should be given preference.—*Bulletin de l'Association Suisse des Electriciens*, September 22, 1929.

Traction

Electric Locomotives for Spain. — Radiating from Barcelona, three main lines, totaling 171 miles, now use electric locomotives. The direct-current system with nominal 1,350-volt overhead supply is used, but the potential varies between 1,100 and 1,800. Six motors driving the six running axles over a reduction gear develop a total of up to 400 hp., giving the engine and a 220-ton train a top speed of 50 m.p.h. The motors are forced air cooled, receiving their air supply from a motor-driven fan. The motor control is electro-pneumatic with controller and 22 contactors. Group connection of motors and five resistance starting steps are provided, with eighteen positions on the handle. Air vacuum brake and regenerative motor breaking are installed. All controls operate on a 65-volt direct-current circuit, supplied from a motor-generator in parallel with a storage battery of 575 ampere-hours. —*Bulletin Oerlikon*, October, 1929.

Miscellaneous

Electrification of Egypt.—F. J. RUTGERS.—With the exception of the port of Alexandria, and the capital of Cairo, general electrification of Egypt is little developed. There are at present 36 installations, with a total output of but 76,940 kw. and an annual production of 79,000,000 kw.-hr. in the whole country. It is of great interest to note that of these plants six are steam operated, one is a hydraulic station and the remaining (29) are Diesel installations. The latter are being used in sizes of 30 hp. to 5,000 hp. The majority of these plants are producing three-phase current, transmitted at 2,000 to 10,000 volts, with a few direct-current and one single-phase system. Extensive plans for future electrification are under way, particularly for irrigation purposes and for the production of artificial fertilizer. One of these projects foresees the harnessing of the overflow of the great dam at Assouan, where a hydraulic head varying between 12 and 100 ft. would have to be taken care of. Several 10,000 kw. of energy could be obtained, but the current consumption would be 500 miles away. The other project covers a desert depression near Quattara, into which water from the Mediterranean Sea could be diverted (a distance of 37 miles), producing an available head of 135 ft. with enough water to produce 200,000 kw. with a market at Alexandria 100 miles away, and Cairo, 130 miles distant.—*Bulletin de l'Association Suisse des Electriciens*, September 22, 1929.

News of the Industry

Revolutionary Changes for California Utilities?

Natural-Gas Conservation Law May Lead to Replacement of Oil as Fuel and Also Make Hydro-Electric Generation Uneconomical

A LAW passed by the last Legislature of California for the conservation of the natural-gas resources of the state by forcing the use for fuel of the vast quantities that now escape into the atmosphere in the oil fields may bring about a revolution in the light and power industry there by causing the replacement of fuel oil by gas under the boilers and by making uneconomical the further building of hydro-electric plants. Waste of natural gas in a single month last summer reached 29,000,000,000 cu.ft. in California as against 7,800,000,000 cu.ft. sold by the oil companies and 17,000,000,000 cu.ft. used by these companies themselves. Under the new law the surplus must be stored or marketed. This will limit the overproduction of oil, on the one hand, and, it is declared, will bring a reduction in the cost of gas, on the other, to a price conceivably as low as 2 cents or even 1 cent per 1,000 cu.ft.

Even with the price of transportation added, such low-cost fuel will obviously have a great effect on the electrical industry of the state. It is argued that it will lead to future power development being almost entirely by steam, because hydro competition would become impossible. Boulder Canyon energy would, it is predicted, enter a highly competitive market. Moreover, the gas would compete with electricity for heating and cooking purposes. While no alarmist ideas are being entertained, electrical men in California are becoming very much interested in the future situation.

Jurisdiction Over Holding Companies in Maryland

Public utility holding companies with properties in Maryland are subject to the jurisdiction of the Public Service Commission of that state and must obtain permission from it before issuing stock, William Cabell Bruce, general counsel for the commission, said last week in a written opinion. The opinion was given at the request of the commission when the Central Public Service Corporation applied for authority to issue 800,000 shares of stock on its holding, the Hagerstown Light & Heat Company. The petitioner, while making the application as a matter of courtesy, disputed the commission's jurisdiction. In his opinion Mr. Bruce said:

"The applicant is a Maryland corporation, and, in addition to its character as a holding corporation and otherwise, is expressly authorized by its charter to perform the corporate functions of a gas corporation, and owns all, or the majority, of the common stock of the Central Gas & Electric Company, a foreign corporation, which in turn owns all, or a majority, of the common stock of the Hagerstown Light & Heat Company of Washington County. Under these circumstances, the applicant, in my opinion, is a 'gas corporation,' and as such as subject to the jurisdiction of the Public Service Commission."

Municipal Ownership Loses in Marietta, Wins in Medina

Whether the Monongahela-West Penn Public Service Company should receive a contract to furnish electric light service for the city of Marietta, Ohio, or whether the city-owned plant should be equipped for that purpose, was the chief issue in Tuesday's election there. Mayor John W. Gray, who favored the city plant, was defeated for re-election by F. A. Steadman by a substantial majority.

John R. Moore, Medina, Ohio, for several years an advocate of municipal ownership of public utilities, was elected Mayor of that town at Tuesday's election.

Massachusetts Fixes Date for Utility Inquiry

An investigation covering the control and activities of public utilities in Massachusetts will be started November 13 by a special recess commission created by the 1929 Legislature according to a statement by the chairman of the commission, State Senator Frank W. Osborne of Lynn. The hearing will be general and not limited to any particular phase of the matter under investigation, the chairman said. The commission is inspecting replies to a questionnaire sent to gas and electric companies.

The general counsel for the commission, Arthur D. Hill, will confer with Robert E. Healy, chief counsel for the Federal Trade Commission, and William J. Donovan, general counsel of the New York legislative commission investigating commission law and practice.

Tokyo Congress Came to a Close Thursday

NEARLY eight hundred papers were presented at the World Engineering Congress and the sectional meeting of the World Power Conference held jointly at Tokyo last week and this, under the presidency of Baron Furuichi, and of which the opening was recorded in the ELECTRICAL WORLD for November 2. The sessions of the many divisions were well attended. Most of the papers were read only in abstract or by title. In the discussions English was used almost exclusively. Excerpts from some of the more important of the electrical papers contributed by American engineers will be printed next week.

Everything possible was done by the Japanese hosts for the comfort, convenience and pleasure of their guests. Receptions, luncheons, dinners, classical dances and garden parties in the settings that only Japan can furnish followed one another and assured the social as well as the technical success of the meetings. Notabilities from whom invitations came included the Crown Prince, the Prime Minister and many other high officials. Transportation was furnished on government railroads without charge to points of interest, and arrangements for longer trips following the adjournment of the sessions were complete.

Papers by Japanese engineers indicated the rapid advance of that nation in industry and manufacture.

A proposal was made by Doctor Spacek of Prague for a World Engineering Federation to be organized at the next congress. Chicago has been mentioned as the next meeting place of the congress, the date to coincide with the opening of the World's Fair there in 1933.

Commissioner Lewis Criticises Utility Rush to Courts

Precipitate recourse to the courts by public utility companies dissatisfied with state regulation was criticised before the annual meeting of the Indiana State Chamber of Commerce in Indianapolis recently by Ernest I. Lewis, chairman of the Interstate Commerce Commission. Asserting his respect for the function of courts in making a check over interpretations of law by commissions, Mr. Lewis condemned the policy of rushing to the courts which, he asserted, "the utility companies especially have been indulging in."

"That begins to look like an effort to nullify state regulation," he said. "In the long run, these court decisions are very likely to react on those who seek them."

Death Takes John W. Lieb

Senior Vice-President of New York Edison Company and Outstanding Pioneer of the Electrical Industry Was Widely Honored as Man, Engineer and Executive

JOHN W. LIEB, senior vice-president of the New York Edison Company and an outstanding pioneer in the electric public utility field, died at his home in New Rochelle, N. Y., on November 1, at the age of 69 years. Mr. Lieb had been seriously ill for some weeks, and his death was not unexpected. It aroused wide regret among his associates in the high counsels of the industry and on the part of others with whom he had labored in various fields.

Born in Newark, N. J., in 1860, he was graduated from the Stevens Institute of Technology in 1880, and for a short while worked as a draftsman for the Brush Electric Company of Cleveland. In 1881 he was made an assistant in the engineering department of the Edison Electric Light Company, just organized in New York, and in the following year was put in charge of the installation of the electrical equipment of the pioneer Pearl Street station. On the inauguration of regular electric service on September 4, 1882, Mr. Lieb was appointed first electrician of the Edison Electric Illuminating Company of New York.

In 1883 young Lieb was chosen by Mr. Edison to supervise the erection and operation of a station for the Italian Edison Company in Milan, Italy. There, by dint of ability and indefatigable industry, he forged to the front and became a recognized leader in promoting the electrical development of that country.

At the invitation of the president of the Edison Electric Illuminating Company of New York, Mr. Lieb returned to the United States in 1894 and was made assistant to the vice-president, and subsequently he became vice-president and general manager of the company.

On the organization of the New York Edison Company Mr. Lieb was made associate general manager with the late Thomas E. Murray, and he eventually became vice-president and general manager of the company. Last year, when the Brooklyn Edison Company was brought under the control of the Consolidated Gas Company (owner of the New York Edison and its associated electric companies in the metropolitan district) and M. S. Sloan became president of the combined electric properties, Mr. Lieb relinquished the active duties of management to become senior vice-president.

Throughout his life Mr. Lieb took a prominent part in the work of many of the organizations in the electrical and allied fields. He was a past-president of the American Institute of Electrical Engineers, the National Electric Light Association, Association of Edison Illuminating Companies, Edison Pioneers and the New York Electrical Society, and a member of the American Society of Civil Engineers, the American Society of Mechanical Engineers, of which he was a vice-president; the Illuminating Engineering Society, the American Association for the Advancement of Science, the New York Academy of Science, the Franklin Institute and other technical bodies, besides being a trustee of the Stevens Institute of Technology, his Alma Mater.

John W. Lieb

Intense as Mr. Lieb's activities were, they were largely confined to the one industry to which he had devoted his life. He thought, however, in national and international dimensions. While local and national utility problems naturally gripped his attention, international relations commanded much of his time and thinking. He was a member of the Institution of Electrical Engineers of Great Britain, the Elektrotechnischer Verein of Germany and the Associazione Elettrotecnica Italiana and represented many American professional and technical organizations in international conferences. Besides taking part in the deliberations of foreign societies (he spoke four languages fluently), Mr. Lieb was an outstanding figure in the promotion of amity, peace and good will among the technical and engineering men of the world.

The eleven years spent in Milan broadened Mr. Lieb's viewpoint and quickened his literary and artistic taste. It even reflected itself in his personal appearance. He became a devotee of the celebrated Leonardo da Vinci, and the lamp posts which he installed on returning to New York reveal a very serviceable application of Italian artistry.

In any discussion of regulation and rates Mr. Lieb was right at home, both from his study of the theory of regulation and his practical knowledge of its administration and the application of service schedules.

In 1923 Mr. Lieb was awarded the Edison medal by the American Institute of Electrical Engineers for his achievement in the development and operation of electric central stations for illumination and power. His Alma Mater honored him with the degree of doctor of engineering, and the King of Italy bestowed on him the decoration of Knight Commander of the Order of the Crown of Italy.

Whatever else history may record of John W. Lieb, it will write him down as a wise and prudent operator who embodied all the traditions of the electrical industry for service. Many will recall his distinguished services for the industry at the time the United States entered the World War. The utilities were confronted with overwhelming demands for electricity owing to the exigencies of that titanic struggle. Fuel, equipment, labor and money were scarce and rationed, and the resources of th public utility companies had to be pooled. Mr. Lieb was chosen wartime president of the National Electric Light Association and threw himself into the work of preparedness with his customary vigor and earnestness, and the accomplishments of the utilities under the added urge of patriotism and sacrifice were nothing short of miraculous. Mr. Lieb showed operating and executive acuteness and energy during those trying times which impressed his associates and placed the industry under great obligation to him. He showed in the wider sphere those qualities which those who knew him had already found in him.

Leaders of the Industry Pay Tribute to Lieb

The death of Mr. Lieb brought out expressions of regret and respect that were more than nation-wide. A few written tributes from leaders of the industry and close associates in America, including Thomas A. Edison, and cabled expressions from eminent Italian engineers follow:

From THOMAS A. EDISON:

"John W. Lieb was one of my most able assistants, and in the early days I used him in the development of the Pearl Street central station. He was a most energetic and active man and had such a comprehensive understanding of my electric lighting system that I selected him to go over to Italy and establish the Milan central station. He made a great success of the installation and of the introduction of the system in Italy. One of his notable achievements was the lighting of La Scala, the great opera house in Milan. His work in Italy was of a pioneering nature and

led to the promotion of the great hydro-electric system which has been so extensively exploited in that country. His work there was but the beginning of a great and noteworthy career which unfortunately has come to an untimely end. He was a man of fine and sterling character, and I always had a very warm regard for him."

From CHARLES L. EDGAR, president Edison Electric Illuminating Company of Boston:

"John Lieb was in my belief the foremost electrical engineer among the leaders of the central-station industry. He was a pioneer in applying American methods to the light and power field in Italy and held many deserved honors for his achievements. He was a solid citizen in the electrical commonwealth. His work as an executive in the New York Edison Company, his mastery of rate making in its relation to regulation, his broad grasp of utility statemanship and able services to the United States during the World War contributed much to the welfare of the electrical industry."

From ALEX DOW, president Detroit Edison Company:

"There is nothing that I can say to add to the realization of loss throughout Mr. Lieb's very wide circle of admirers, throughout the industry in which he was a leader, and throughout the engineering world, which has recognized his outstanding merit for almost half a century."

From M. S. SLOAN, president New York Edison and associated companies:

"In the death of Mr. Lieb the electrical industry loses one of its pioneers and truly great leaders. Working with Edison, he developed central-station practice, and his experience and ability had been devoted ever since to a steady improvement of technical standards. In addition to his exacting company duties, he gave lavishly of his time and energy, through association activities, to the advancement of the electrical art in its broadest aspects. As a man and as an engineer he was held in high esteem and affection by all who came in contact with him."

From ARTHUR WILLIAMS, for many years an associate of Mr. Lieb:

"John W. Lieb was an outstanding pioneer in the electrical utility field. To it his entire life was devoted. His work, beginning in the earliest days of historical Pearl Street under the personal direction of Mr. Edison himself, has always been of a most constructive nature. Even then his ability and many aptitudes must have impressed Mr. Edison, for he was selected to take the Edison system to Italy, a field in which he served with outstanding ability until he was invited to return to this country by R. R. Bowker, then chief executive of the predecessor of the present New York Edison Company. It is, of course, well known that he continued in this important relationship until the time of his death. Probably no more versatile mind other than that of the great Edison himself has been identified with the electrical industry.

"Those who long knew him realize the importance of his many contributions at a time when wiser policies were to be attained and the higher obligations of the industry still lacked definite formulation. His presence in life will be greatly missed, but his work and influence will long survive."

From G. G. PONTI of Turin, Italy, president of the International Association of Producers and Distributors of Electricity:

"The name of John W. Lieb is linked to the history of the electrotechnical industry of Italy as one of its earliest and most active and deserving pioneers. A great friend of Italy and a learned disciple of our Leonardo da Vinci, John Lieb leaves a large place empty among us. As one of his thousand friends and as an Italian, I bow reverently to his memory in this hour of sorrow for the electrical industry of the world."

From DR. ALBERTO PIRELLI of Milan, Italian statesman and captain of industry:

"I deeply mourn Lieb as an old and dear friend, as a man who loved my country and as a pioneer of electricity."

From GUIDO SEMENZA of Milan, eminent Italian consulting engineer:

"Everywhere the name of Lieb meant clearness, common sense, geniality, enthusiasm and solid work. By his achievements as an engineer in Milan, his studies and worship of Leonardo da Vinci and his valuable assistance to Italians who emigrated, he has left in Italy a vivid and lasting memory of himself."

W. B. Foshay Company in Receivership

Minneapolis Firm with Widespread Ramifications Unable to Meet Its Obligations—Electric Light and Power Holdings Are Scattered and of Very Small Size

W. B. Foshay

FAILURE attributed to "overexpansion and contraction of securities sales" forced the W. B. Foshay Company of Minneapolis and the associated Public Utilities Consolidated Corporation and W. B. Foshay Building Corporation into a receivership on November 1, Joseph Chapman, Minneapolis merchant and banker, being appointed receiver by the United States District Court.

Involved in the crash are utility companies of all kinds scattered over many states and including properties in Alaska, in Ontario and Quebec and in Mexico and Central America. The individual companies that make up the holdings are not large—most of them are tiny. Three small banks are also involved in the collapse, but it is said there will be no loss to any depositor.

The receivership proceedings against the Foshay institutions involve $20,000,000 of property and approximately $12,500,000 of liabilities. Three separate actions were started in the federal court—one against the company by its vice-president as a creditor on a note for $5,000, one against the utility company for $7,740 for insurance premiums, and a third against the building corporation for open accounts of indebtedness totaling $655,000.

While the failure caused somewhat of a sensation in the Northwest and was generally attributed to the slump in Wall Street, it was expected and inevitable regardless of stock market conditions. Mr. Foshay had been having difficulties with bankers for some months and maintained offices in 25 cities for the sale of securities. His methods were occasionally spectacular, as when he recently dedicated with a three-day program the 32-story Foshay Tower in Minneapolis, which is fashioned somewhat after the Washington Monument.

Mr. Foshay, who is not yet 50 years old, has had a remarkable career in the public utility field, which brought him fame and fortune in a few years. As a lad he was engaged in railroading in New York. Then he entered the employ of the United Gas Improvement Company, where he obtained his first experience in public utility operation. Gradually working his way West, he joined the staff of the Electric Bond & Share Company at Wichita, Kan., and finally became manager of the Walla Walla office of the Pacific Power & Light Company.

He then became connected with the Northwest Electric Company of Portland, Ore., and eventually drifted into general consulting work. About 1915 he went to Minneapolis and joined the engineering staff of Page & Hill, wholesale producers and distributors of cedar poles. He was without funds at the

time, but soon laid the foundation for his subsequent career and rapid rise in public utility circles in the Northwest.

Borrowing some money, he purchased a number of small properties in the Middle West and formed the W. B. Foshay Company in 1917. From this modest beginning he quickly acquired utility properties in Minnesota, South Dakota, Kansas and Nebraska and other scattered states and in 1925 sold out his holdings, estimated at $10,000,000, to Eastern buyers. He then started to acquire a larger chain and in two years sold it to New York financial interests for a reputed price of $25,000,000.

It was apparent that Mr. Foshay's bent was speculation and not operation —he bought to sell, and during those prosperous years he did well. He started on his third venture in 1927 and, spreading out rather thin, came to grief. He financed, besides his utility enterprises, shipping, lumber, textile, shoe, flour-milling, furniture, drug, rubber and hotel companies, in many of which he held controlling interest. Then came the project of the Foshay Tower, a landmark of the Twin Cities, costing nearly $3,000,000.

In 1919, two years after its organization, the W. B. Foshay Company had four employees and was worth $23,000. At the time of the receivership proceedings the personnel of the organization in Minneapolis alone was more than 400 and its properties were valued at $30,000,000.

The utility properties grouped under the Public Utilities Consolidated Corporation are the Public Utilities California Corporation, Public Utilities Vermont Corporation, Public Utilities Georgia Corporation, Public Utilities Kansas Corporation, Public Utilities Southern Corporation, Public Utilities Honduras Corporation, Citizens' Light & Power & Water Company, Ketchikan, Alaska; Princeton Gas Company, Central Mendocino County Power Company, Utah Valley Gas & Coke Company and the Missouri Gas & Coke Company. The Public Utilities Consolidated Corporation has total assets of less than $24,000,000, and gross earnings as of December 31, 1928, were given as $3,032,421 and net as $1,392,283. The electric properties have a combined rating of 25,697 kva. and are probably not worth more than $10,000,000.

Obviously, such a small group does not count for much in the ten-billion-dollar electric public utility industry, and it is said that the individual utilities which were acquired at very high prices will probably find their way into the hands of larger and stronger interests.

Long Island Lighting Company to Install 75,000 Kw.

Through its executive offices in New York City the Long Island Lighting Company announces that it is completing plans and placing orders for the installation of a 75,000-kw. turbo-generator, high-pressure boilers and auxiliary apparatus. It is expected that this new construction will be completed during 1930. The total power facilities of the company and its subsidiaries will then aggregate about 187,000 kw.

The new machinery is to be placed in the Glenwood plant of the company, which was put into service late last year with one 18,750-kw. generator installed. Initial plans for that station called for the future installation of larger units as the requirements of the company should expand, but rapid growth in Nassau and Suffolk Counties has compelled a change to a schedule of 75,000-kw. units. The plant has a very favorable location on water for fuel delivery and condensing water. During the past year the company has been making extensive additions to its high-tension transmission lines, which extend over Long Island. It has grown to its present size in the nineteen years since 1910, when the company initiated its public service with the erection of a unit rated at 700 hp. in the Northport central station, its original generating plant.

Purchases and Mergers

Will Ontario Hydro Buy Foshay Properties in Province?—Iowa Company Bids for Saskatchewan Plant — Southern Cities Utilities in Haiti

FINANCIAL circles in Ontario expect that, as a result of the failure of the W. B. Foshay Company, the Ontario Hydro-Electric Power Commission may be able to acquire at a low price the utility properties which this company controlled in Bruce County and which have been a source of political contention. It is understood that the commission had been negotiating for these properties, but the price set by Mr. Foshay, $750,000, was considered too high.

An American utilities company and the Saskatchewan Power Commission were bidders recently for Moose Jaw's municipal electric plant and distribution system. The United States firm interested in securing this foothold in Saskatchewan is the Iowa Southern Utilities Company of Centerville, which made an offer involving in its entirety the sum of $3,275,500. The Saskatchewan Power Commission submitted a proposal involving a purchase price equivalent to the outstanding debenture indebtedness, less the sinking fund, and an allowance equivalent to the present value of investment in the property made by the city. The United States company asked for a 20-year exclusive franchise and promised reduction of rates on electricity. The two offers will be considered by the City Council.

Electric systems serving Port-au-Prince and Cap Haitien, the principal cities of Haiti, have been added to the system of the Southern Cities Utilities Company, which a few months ago acquired the public utilities formerly operated by the Dominican Republic on the same island. The purchase of the Compagnie d'Eclairage Electrique des Villes de Port-au-Prince et de Cap Haiten, the operating company for the Haitian properties, was consummated with its transfer to the new management, headed by Walter Whetstone of Philadelphia. The Haitian company has two generating stations and more than 100 miles of distribution lines. The Southern Cities Utilities also operates utilities in Porto Rico, the Philippines, Spain and seven states in this country.

A special election will be held December 10 upon sale of the Shelbyville (Ill.) municipally owned electric light and power distribution system to the Central Illinois Public Service Company for $250,000.

Joint application has been filed with the Missouri Public Service Commission for authorization of the sale by the Liberal Light & Power Company to the Ozark Utilities Company of Kansas City of the electric distribution systems at Liberal, Bronaugh and Moundsville. The purchase price is $76,000. The St. Joseph Railway, Light, Heat & Power Company filed an application for authority to purchase the electric light plant at Oregon, Holt County, for $6,500.

The Missouri Public Service Commission has authorized the Empire District Electric Company to purchase the municipal electric distribution system in Joplin, Mo., for $100,000 cash. The city joined in the request.

From private owners the Iowa-Nebraska Light & Power Company has purchased the plant serving the town of Martell, carrying out a program of purchase which has included taking over a number of plants in villages within a 20-mile radius of Lincoln and serving them from its Lincoln plant.

Negotiations have been completed to transfer the Harrison (Ark.) plant of the Southwestern Gas & Electric Company to the Arkansas Power & Light Company. Harrison will become district headquarters for north Arkansas territory, including Yellville, Cotter, Berryville and other places. It is reported that the Southwestern company will take south Arkansas holdings in exchange. The Harrison property is valued at about $250,000.

The Evansville (Minn.) distribution system will be sold to the Otter Tail Power Company of Fergus Falls as the result of a municipal election.

The New Jersey Power & Light Company has asked the New York Public Service Commission for permission to acquire 182,725 shares of the common capital stock, without par value, of the Staten Island Edison Corporation, which distributes electricity in the Borough of Richmond, New York City. Both corporations are affiliated with the New York State Gas & Electric Corporation.

The Westchester Lighting Company, Mount Vernon, N. Y., has filed certificates in the office of the Secretary of State merging with it the Peekskill Lighting & Railroad Company and the Northern Westchester Lighting Company of Ossining, both of which it controls.

Hearings have been closed by the New York Public Service Commission on a petition of the Malone Light & Power Company for authority to acquire the Fort Covington Light, Heat & Power Company in Franklin County and the outstanding capital stock of the Milling & Lighting Company, St. Lawrence County. Hearing has also been closed on the petition of the New York Power & Light Corporation for authority to acquire the outstanding stock of the Schodack Light & Power Company. The commission has granted permission for the transfer by the Moose River Power Company of its franchises and system to Charles E. Norris, as nominee of F. L. Carlisle & Company, in exchange for 30,000 shares of common stock of the Niagara-Hudson Power Corporation. The Moose River Power Company has never functioned as a public service corporation.

Rate Agreement Reached at Portland, Ore.

Pending Commission Proceedings a Novel Method of Revising Power Charges Is Followed by Central-Station Companies and City

REDUCED power rates in Portland, Ore., following studies carried on by the rate experts of the two utility companies with engineers of the Oregon Public Service Commission, the city attorney and rate experts representing the city, are said to give Portland rates comparing favorably with those in all cities of its class. The reductions apply also to Salem and Oregon City, Ore., Vancouver, Wash., and other towns in the Portland area served by the Portland Electric Power Company and the Northwestern Electric Company in which the existing Portland schedules apply, and will affect four thousand customers.

New schedules separate power and lighting, which under the old schedules were combined, and these are divided as to power customers using 15 kw. or less and customers using more than 15 kw. This separation of power and lighting is to make the schedules more readily comparable with schedules in other Coast cities. The existing combined light and power schedule will still remain in effect for those customers who, with a preponderance of lighting in their plants, might have to pay more under the new schedules. Accurate estimates have not been made as to the exact amount of saving that will be effected for the present power users.

The method of making these new rates was unique. In view of the long period of time that would be required to complete the investigation now being made of the Portland Electric Power Company's valuation and rates for all classes of service, the Public Service Commission, recently reorganized under the chairmanship of Frank J. Miller, urged a voluntary reduction in the power field with co-operation of the various interests involved. Then Franklin T. Griffith, president Portland Electric Power Company, and Guy W. Talbot, president Northwestern Electric Company, issued a joint statement announcing their agreement on the rates proposed and said that revised tariffs would be filed to become effective December 1.

In the meantime the hearing on the valuation and rates of the Portland Electric Power Company is to commence as scheduled, November 12.

Wiring Thousands of Houses for Shannon River Power

Some time in the coming winter the Shannon River power station, where the intake gates controlling the passage of water into the canal along which it will flow to the power station are now open, will be ready to supply electrical energy to the whole of the Irish Free State, according to a report from Consul-General Cornelius Ferris, Dublin, made public by the Department of Commerce. The wiring of houses has proceeded rapidly, much of the work being done by the installation department of the Electricity Supply Board. Thousands of houses are being wired on the "hire-purchase" system, and many small villages which up to the present have been dependent on oil lamps and candles for illumination will during the coming winter, Mr. Ferris says, enjoy the advantages of electricity, not merely for lighting, but for cooking and other domestic purposes.

In order to enable people of limited means to purchase electrical appliances of all kinds, a hire-purchase system has been adopted, only 5 per cent being charged on money outstanding. The Electricity Board anticipates a consumption amounting to 144,000,000 kw.-hr. in 1932.

Electricity used for lighting and domestic purposes in private dwelling houses will be charged for at a fixed amount, dependent on the poor-law valuation of the house, plus a varying charge per kilowatt-hour. At Limerick, for instance, this will be 2 cents.

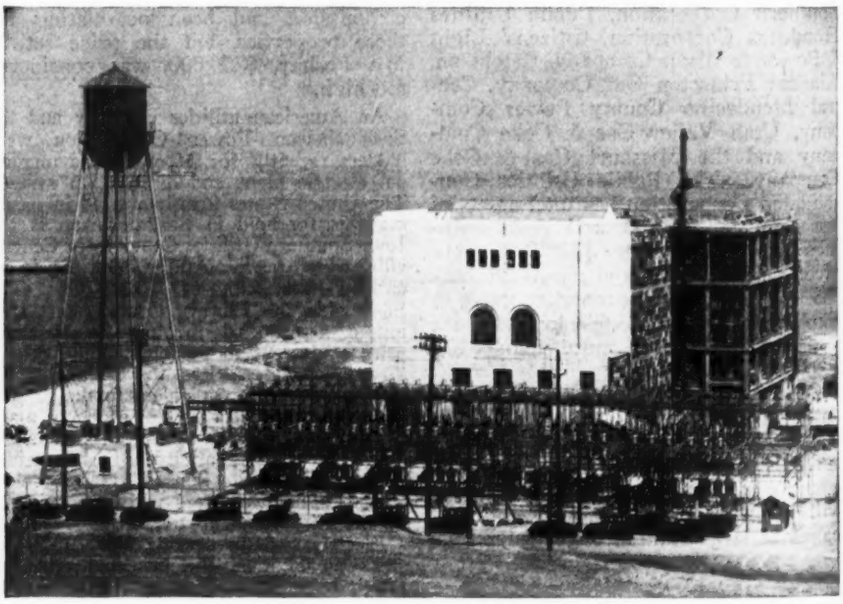
A chain of showrooms is to be established throughout the country in which practical demonstrations of various electrical material will be given. These showrooms will not only be provided with demonstrating equipment but will be stocked with material for sale in their respective areas.

Geological Survey Examines Skagit River Dam Sites

The Skagit River, the largest tributary of Puget Sound, is navigable for the lower 50 miles, says a report of the Geological Survey just released, and on its upper reaches might generate power enough to supply all the region thereabout. The upper 70 miles has a fall of more than 1,400 ft. nearly all of which could be used to produce power. With the natural flow about 187,000 hp. could be generated on this stream 90 per cent of the time, and with regulation by storage reservoirs this could be increased to almost 487,000 hp. Additional power could be furnished by the tributary streams in the Skagit River basin.

A reservoir to serve primarily for flood control has been proposed for the Skagit River below the Sauk River, the dam to be built near Faber Ferry. A dam 250 ft. to 300 ft. high in this vicinity would, it has been estimated, create sufficient storage capacity to control the combined floods of the Skagit and Sauk Rivers and probably would produce all the power needed by the neighboring region for some time to come. Two proposed dam sites near Faber Ferry, about 5 miles above Concrete, were, however, examined in September, 1926, by J. T. Pardee, of the Geological Survey, whose report indicates that these sites are of doubtful value because of geological conditions.

Great Western Power's San Francisco Steam Plant



CONSTRUCTION of the 35,000-kw. steam-electric plant of the Great Western Power Company on India Basin, South San Francisco, is virtually finished. The building proper reached the stage shown above some weeks ago, and effort was then concentrated on the installation of machinery. H. K. Fox, construction engineer in charge of the work, expected the plant to be put into operation during the first part of November. It will be tied in with the Great Western company's system by three distribution lines and three tie lines radiating from India Basin. This project represents a present investment of more than $4,000,000 and will have an ultimate capacity of 170,000 kw.

Briefer News

IMPROVING MINNEAPOLIS' "WHITE WAY."—Minneapolis soon will have an improved "white way," authorization for the installation of new light standards on Nicollet Avenue on ten blocks in the downtown section having been given. There will be six standards in each block. The new installation will cost $38,300, and business men along the avenue will pay the additional cost of maintenance.

FIVE-YEAR-OLD PLANT IN ARKANSAS NO LONGER USEFUL.—The march of electrical progress has caused the disuse of a generating plant at Ola, Ark., built only five years ago at a cost of $350,000 for the Arkansas Public Service Company, now merged with the Arkansas Power & Light Company. The latter company has begun to supply Ola and four other Yell County towns with Remmel Dam power transmitted from Russellville, and the Ola plant may be abandoned.

RICHMOND EXTENDING ITS HOLLYWOOD PLANT.—Two additional hydro-electric generators of small capacity, with the auxiliary equipment, are being added by the city of Richmond, Va., to its Hollywood plant and will be ready early next year. They will develop additional power from the James River canal. According to George H. Whitfield, director of public utilities, the plant will pay for itself and for the rent of the canal within ten or twelve years.

IMPROVED SERVICE FOR PENN YAN AREA, NEW YORK.—According to an announcement made at Penn Yan, N. Y., the New York Central Electric Corporation will spend $170,000 in improving service in that locality, following plans made by American Gas & Electric Company engineers. The substation at Shutts Mills now served from Geneva will be discontinued and a new one built at St. John's Mills on the Keuka Lake outlet, new turbines will be installed at Seneca Mills, and transmission lines will be built and extended so as to give Penn Yan and Yates County three separate sources of energy.

BRANDON, MANITOBA, TURNS TO PROVINCIAL HYDRO FOR ITS ENERGY.—The ratepayers of Brandon, Manitoba, have indorsed a bylaw providing for a contract between the city and the provincial Hydro system for electricity. Up to the present the city's supply has been furnished by the Canada Gas & Electric Company. Since 1925, when the city refused to renew the company's franchise for a period of twenty years, negotiations have been continually in progress between the city and the province, but it was only a few months ago that the province's terms were cut to a basis that was considered attractive by Brandon. The provincial Hydro is to supply power in bulk to the city, and the next move will be for the city to develop its distribution system.

LOCK 12 DAM TO BE CHRISTENED FOR WILLIAM P. LAY.—The Alabama Power Company will honor William P. Lay, its founder and first president, on November 23, when its dam at Lock 12 on the Coosa River will be formally christened "Lay Dam." President Thomas W. Martin will have charge of the dedication, and prominent guests are expected. Lock 12 dam was conceived by Captain Lay, and it was under his direction that it was actually constructed. Special trains will be operated from Birmingham and Montgomery to Clanton for the occasion. From Clanton the party will go by motor to the site of the development.

OCHLOCKNEE RIVER PLANT IN FLORIDA STARTS UP.—The 16,000-hp. hydro-electric plant which has been building for nearly three years on the Ochlocknee River in Florida about 26 miles west of Tallahassee for the West Florida Power Company, now a subsidiary in the Insull group controlled by the National Public Service Corporation, has gone into operation. It contains three generating units and cost about $3,000,000. There is a concrete dam and spillway across the river 36 ft. high and an earthern dike a mile long, forming a reservoir 15 miles in length.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue of July 6, page 46.]

National Electrical Wholesalers' Association—Hotel Cleveland, Cleveland, Nov. 11-15; Pacific Division, Del Monte, Calif., Jan. 31-Feb. 1. E. Donald Tolles, 165 Broadway, New York.

Electric Heating and Welding Conference—William Penn Hotel, Pittsburgh, Nov. 13 and 14. J. F. Kelly, Empire Bldg., Pittsburgh.

Public Utilities Association of Virginia—Chamberlin-Vanderbilt Hotel, Old Point, Va., Nov. 21 and 22. A. B. Tunis, 306 Grace Securities Bldg., Richmond, Va.

National Electrical Credit Association—Central Division, Palmer House, Chicago, Nov. 21 and 22; New York Division, Hotel Pennsylvania, New York City, Dec. 10; New England Division, University Club, Boston, Jan. 21. F. P. Vose, 1008 Marquette Bldg., Chicago.

American Institute of Electrical Engineers—District meeting, Chicago, Dec. 2-4; winter meeting, New York, January 27-31. F. L. Hutchinson, 33 West 39th St., New York.

American Institute of Mechanical Engineers—New York, Dec. 2-6. C. W. Rice, 29 West 39th St., New York.

American Society of Refrigerating Engineers—New York, Dec. 4-7. D. L. Fiske, 37 West 39th St., New York.

American Engineering Council—Washington, Jan. 9-11. L. W. Wallace, 26 Jackson Place, Washington, D. C.

North Central Division, N.E.L.A.—Commercial Section, St. Paul Hotel, St. Paul, Jan. 20-21; Engineering Section, Nicollet Hotel, Minneapolis, Feb. 24-25. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

MONTREAL ISLAND POWER COMPANY DEVELOPMENT COMPLETING TWO UNITS.—Early this month the Montreal Island Power Company will bring into operation the first two units of the hydro-electric plant it is building on Back River near the city. These units, with a combined maximum rating of 24,000 hp., will feed into the distributing system of the Montreal Light, Heat & Power Consolidated. Eventually the plant will have ten units of the same size, but only six are yet under construction.

NEW DAM FOR SHAWINIGAN COMPANY.—With a view to regulating the water in the Mattawin River, in the Province of Quebec, so that a greater minimum flow may be made available, the Shawinigan Water & Power Company has commenced the erection of a dam at Toro Rapids, near St. Michel des Saints, which will be 2,400 ft. long and will include an earth section 1,830 ft. in length having reinforced-concrete walls at the channel and a concrete section 570 ft. long. The project is estimated to cost $2,300,000.

INDIANS HELP BUILD ST. REGIS DAM IN NORTHERN NEW YORK.—The dam being built across the St. Regis River at Hogansburg, N. Y., by the Malone Light & Power Company is nearing completion. It will cost about $1,000,000 and will furnish the company with a steady output of about 1,200 hp. and a peak of more than 3,000 hp. Its capacity can be doubled in the future if regulating basins are built further up the river. An unusual incident has been the employment of Indians from the St. Regis reservation as laborers.

WATER USERS WANT TO DEVELOP UTAH'S POWER RESOURCES.—The generation of 125,000 hp. of hydro-electric energy, together with the development of 1,000,000 acre-feet or more water for irrigation, is a part of the program for the use of state water resources presented to the Water Storage Commission of Utah by the Strawberry Water Users' Association. The program concerns the Salt Lake and Sevier drainage areas and envisions the reclamation of considerable areas of land in Millard, Juab, Utah, Salt Lake, Sanpete and Tooele Counties. Power development would be at reservoirs on Deer Creek and Diamond Creek.

NEW FIRM BACKS DEVELOPMENT ON THE TEXAS COLORADO.—Application has been made to the Texas State Board of Water Engineers by the Emery, Peck & Rockwood Development Company for renewal for two years of the permit which was held by the Syndicate Power Company for the construction of a dam and hydro-electric plant near Marble Falls on the Colorado River. The Emery, Peck & Rockwood Development Company has offices in Seguin, Tex. It is said to represent Chicago financiers who are willing to go ahead with the

water-power projects on the Colorado, of which the proposed development at Marble Falls is one. These projects at one time elicited the interest of the Insulls, but opposition by rice growers in the territory led to their plans being dropped. Originally six hydro plants were planned.

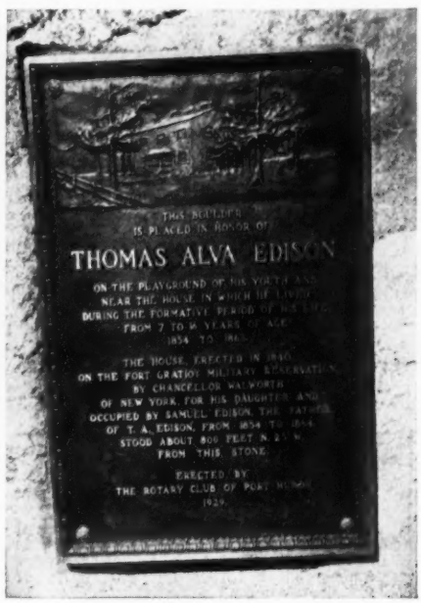
CENTRAL POWER & LIGHT COMPANY EXPENDING $8,000,000 FOR IMPROVED FACILITIES.—The extensive building of transmission lines in west Texas by the Central Power & Light Company of San Antonio, as well as its new plants and units on the Devil's River and at Victoria and San Benito, as noted in the ELECTRICAL WORLD from time to time, have involved a total expenditure of $8,000,000 approximately for the year 1929. Last year the company spent $9,000,000 in the endeavor to keep pace with its territory, largely in oil-producing territory.

COEUR D'ALENES TO GET MORE POWER.—Vice-President M. W. Birkett of the Washington Water Power Company announces the authorization of another 110-kv. transmission line, from Spokane, Wash., to Kellogg, Idaho, 80 miles. The new line will supply more power for the Coeur d'Alene mining district. It will be known as Coeur d'Alene No. 4 and will replace the old No. 2 line of 60,000 volts constructed in 1907. Construction of the new line will give the Washington Water Power Company two 110-kv. power lines to the Coeur d'Alenes. At the East Side substation, at the east city limits of Spokane, the new line will connect with main lines leading to the Chelan, Long Lake, Little Falls and other power plants of the company.

PROJECT FOR COWLITZ RIVER, WASH.—In contemplation of a hydro-electric power development of 39,000 theoretical horsepower, application has just been made to the state hydraulics office at Olympia, Wash., by Frederick L. Pitman of Grandview for appropriation of 400 sec.-ft. of water from the Muddy Fork of the Cowlitz River, in the extreme eastern part of Lewis County. A 40-ft. earth and rock dam, with cement where needed, 1,800 ft. long, will impound 2,000 acre-feet in Rainier reservoir, while the diversion dam of concrete-arch type will be 100 ft. high, 250 ft. long on top and 75 ft. long at bottom. A conduit nearly four miles long will be built and a fall of 800 ft. utilized, the water being returned to the Ohannepecosh branch of the Cowlitz.

ABOUT TWENTY MILLION DOLLARS INVOLVED IN INITIAL INSTALLATIONS ON LEWIS AND COLUMBIA RIVERS.—Issuance of licenses by the Federal Power Commission (ELECTRICAL WORLD, October 26, page 853) to the Inland Power & Light Company of Portland, Ore., to develop power on the Lewis River in Washington State and to the Washington Electric Company of Seattle to develop a Columbia River site near Wenatchee, Wash., will bring a total expenditure of $8,250,000 for the dam and first unit on Lewis River and one of $10,000,000 to $12,000,000 for the initial installation on the Columbia. The completed plants will cost much more. The Inland Power & Light's plant is to be operated by the Northwestern Electric Company. The Washington Electric is a subsidiary of the Puget Sound Power & Light Company.

PORT HURON'S EDISON MEMORIAL.—Marking the location where Edison lived in his boyhood, a 65-ton boulder bearing this tablet, for which credit goes to the Rotary Club of Port Huron, Mich., was dedicated as part of that city's celebration of "Light's Golden Jubilee." The address was made by James E.



Davidson, president of the Nebraska Power Company, a past-president of the National Electric Light Association, who also spent his youth in Port Huron, where his father built one of the first electric central stations in the United States.

SECOND 132-KV. CABLE FROM HELL GATE TO YONKERS IN SERVICE.—The second 12-mile, 132-kv. cable from the Hell Gate generating station of the United Electric Light & Power Company in Bronx Borough, New York City, to the Dunwoodie distributing station of the Yonkers Electric Light & Power Company was placed in service on November 1. This cable was described in detail in the ELECTRICAL WORLD for July 20 (page 148). The first one has been in operation without a break in service since August, 1927. Matthew S. Sloan, president of the five associated electric light and power companies in the local system, pointed out that the new cable not only increases the capacity for service to Westchester, but also that through interconnection between the generating plants of the system Westchester can draw power from Manhattan and Brooklyn in case such need should ever arise.

DALLAS SUBSTATIONS TO BE IMPROVED.—The City Commission of Dallas, Tex., has approved the expenditure of $169,026 by the Dallas Power & Light Company in additions and improvements to its substations. Work is to be done on the Tyler Street, North Dallas and Trinity Heights stations, and a line between the Trinity Heights and Tyler stations will be built.

MISSOURI POWER & LIGHT CUTS RATES.—The Missouri Power & Light Company has filed with the Missouri Public Service Commission revised electrical rates for domestic and commercial users in Boonville, Brookfield, Excelsior Springs, Kirksville, Mexico and Moberly, Mo. The company recently announced lower rates for Jefferson City. The new schedules for the six towns will become effective on December 1 and provide for a reduction of 1 cent per kilowatt-hour in the top step of regular residential and commercial rates, saving consumers $60,000 a year.

RATES GO DOWN IN EL PASO.—New rates applicable to light and power service, to result in an approximate annual saving of $150,000 to customers, have been announced by the El Paso, (Tex.) Electric Company. The rates cover commercial, industrial and residential uses and are promotional in form. A home lighting rate has been established for limited use, the top step being reduced from 10 cents to 9 cents a kilowatt-hour. An optional home service rate has been designed for unlimited use which will eliminate the necessity of two meters where customers use both lighting and heavy-duty appliances.

KEOKUK DAM NO BARRIER TO COMMERCIALLY VALUABLE FISH.—Commercially valuable fish are not, on the whole, affected adversely by the power dam across the Mississippi at Keokuk, Iowa, according to an announcement by Commissioner Henry O'Malley of the Commerce Department's Bureau of Fisheries, based upon the completion of a report made by Dr. Robert E. Coker, professor of zoology, University of North Carolina. A few kinds of fish have been injured, but others have been helped, he says. Reports that fish in upstream migration were deflected in quantity up the Des Moines River were found to be without foundation.

PROGRAM FOR ANNUAL MEETING OF A.S.M.E.—On the first day of the annual meeting in New York State of the American Society of Mechanical Engineers—Monday, December 2—there will be a session on hydraulic power and another on hydraulic turbines, embracing five papers in all. At the central-station power session, on December 5, F. S. Clark will discuss the effect of large boilers operated at high capacities on the operating characteristics and investment costs of boiler plants, and the performance of modern steam generating units will be the topic of a paper by C. F. Hirshfeld and G. U. Moran.

ELECTRIC HEATING AND WELDING CONFERENCE.—Under the auspices of the Pennsylvania State College and the Association of Iron and Steel Electrical Engineers there will be an electric heating and welding conference at the William Penn Hotel, Pittsburgh, on November 13 and 14, when the industrial plants and the central stations of central Pennsylvania, the electric heating furnace manufacturers, the welding equipment makers, the manufacturers of electrical heating units and the iron and steel industry will co-operate to discuss topics connected with pipe welding, lead and salt baths, welding heavy materials, annealing, steel-melting and induction furnaces, electric galvanizing and use of electricity in developing tool steel.

Alabama's Muscle Shoals Tax Claim to Be Reheard

Order has been issued by the United States Court of Claims at Washington for reargument before that body of the action by the State of Alabama to recover approximately $250,000, which the state claims is due from the government for state hydro-electric tax on power generated and sold by the government at Muscle Shoals. The court has asked that the case be argued again on account of the death of two members of the Court of Claims since original arguments were submitted.

Suit by the state for this tax of two-fifths of a mill per kilowatt-hour, provided for by the present Legislature, on all hydro-electric energy manufactured and sold in Alabama is based on the contention that the federal government in generating and selling electric power at Muscle Shoals has engaged in a private business enterprise, in competition with private hydro-electric companies, and so is liable for the tax. No claim is made for power produced at Muscle Shoals and used for governmental purposes.

District Commission Seeks to Upset Purchase of Utility

Court action sought by the Public Utilities Commission of the District of Columbia to set aside the acquisition of 110,000 of the 130,000 shares of stock of the Washington Gas Light Company by the Seaboard Investment Trust, allied with Harris, Forbes & Company, New York, will be brought by the Commissioners of the District. The action is largely predicated on the opinion of Corporation Counsel W. W. Bride, who declared that a careful investigation made by himself and supplemented by an investigation by the Department of Justice, at the request of the Utilities Commission, had left "much doubt" in his mind whether the whole transaction was not a violation of the La Follette anti-merger law affecting the District, despite the opposite contention of the purchasers.

Recent Court Decisions

YAMHILL ELECTRIC - MCMINNVILLE (ORE.) CASE TO GO TO SUPREME COURT.—Admitting the possible existence of error in the interpretation of the statutory provisions in regard to the confiscation of property with or without the due process of law, the Oregon Supreme Court has signed an order which enables the Yamhill Electric Company to file with the United States Supreme Court an application for authority to submit to that tribunal further argument and testimony in connection with the procedure being instituted by the utility to restrain the city of McMinnville from extending municipally owned electric lines beyond corporate limits and serving customers in territory claimed by the privately owned concern. In the opinion rendered by the Oregon court, it was held that the city of McMinnville was within its constitutional rights in seeking and serving electrical patrons outside of the corporate boundaries. However, the court strongly criticised that part of the Oregon law.

COMPANY FORMED IN ARKANSAS MAY LEASE PROPERTY TO OUTSIDE CORPORATION.—In Arkansas the state constitution prohibits a foreign corporation from exercising the power of eminent domain. In Patterson Orchard Company vs. Southwest Arkansas Utilities Corporation, the plaintiff asked revocation of an order granting permission to the latter company to condemn land running through the other's orchard. The utility company had been formed in Arkansas by the Southwestern Gas & Electric Corporation, a Delaware concern, to build and own transmission lines which were to be leased to the Southwestern Gas & Electric. In confirming the order of the lower court, the Supreme Court of Arkansas held that the Southwest corporation, a domestic corporation, could lease its right-of-way to the Southwestern Gas & Electric Company, a foreign corporation engaged in a similar business which had complied with the laws of the state and is doing business therein, even though the stock of the Arkansas company was entirely owned by employees of the Delaware-incorporated company. (18 S.W. [2d] 1028.)*

MUNICIPALITY CANNOT USE RECEIPTS OF ITS POWER PLANT FOR GENERAL EXPENSES.—The Michigan Supreme Court has ruled, in Freeland vs. City of Sturgis, that funds received from operation of a municipal power plant may not without specific authority be used to meet expenses of the city government, since that would cause customers of the city utility to pay higher rates than would otherwise be necessary. The residents who started the suit claimed that $93,000 in bonds was still outstanding against the municipal plant while $60,000 in receipts was appropriated by the city to pay ordinary governmental expenses and thus reduce the tax rate. The lower court dismissed the action, but the high court sent it back for trial, ruling that the city government had no authority for its action. The effect of the decision in the case of Sturgis has, however, been nullified, because, while the case was awaiting hearing, the voters at a special election last spring approved amendment of the city charter to authorize such use of the plant's funds. The constitutionality of this amendment will be tested in the state courts, it is understood.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

RATES PRESCRIBED BY COMMISSION WHICH ALLOW LESS THAN FAIR RETURN MAY BE ENJOINED.—Declaring that the Public Service Commission could not constrain a public utility to adopt rates giving less than a fair return, although a utility may itself adopt such rates as a matter of policy, the United States District Court in Montana enjoined the enforcement of rates prescribed by the state commission for the Great Falls Gas Company, on suit of the latter. Anticipated expansion of the utility, the court said, did not justify lowering the rate beneath a present fair return. The court held, however, that evidence was properly received concerning values returned by the utility for taxation which were less than 50 per cent of values claimed by it for rate-making purposes, saying that there could not be one true value for taxation and a different true value for rate-making purposes, but that the same value must be taken for both. (34 Fed. [2d] 297.)

Commission Rulings

ANALYSIS OF DEVELOPMENT AND USE OF METERS.—In approving a promotional gas-rate schedule for the Public Service Electric & Gas Company, the New Jersey Board of Public Utility Commissioners entered into a discussion and analysis of the development and use of meters in the measurement of gas and electric consumption. It said in part: "The necessity of a more accurate measure of the cost of service became imperative with the electric utilities because they could not commercially store electricity, but must at all times be ready to meet the demands of the customers, especially those using electricity for power. This condition of affairs led to a change in methods, separating electric costs into three general classes: (1) Customer costs, varying directly with the number of customers; (2) demand costs, varying with the units of horsepower or kilowatts which the customer may demand from the company; (3) the remaining costs, varying with the units of energy used by the customer as measured by his meter. With each of these classes of costs known for a given class of customers, either a three, two or simpler one-part block system of rates may be developed which would be fair for both customer and company. The early knowledge of this form of rate analysis has assisted in the growth of the great electric utilities of the country. In the minimum charge for lighting customers the board included the customer cost as above defined plus a small element of demand for the carrying cost of service and meter (strictly a demand cost) and an average small use of current. The gas industry can store its commodity and the demand of the customer can be largely met from stored gas, thus reducing the peak demand on plant capacity and in a measure the necessity for such a close analysis of costs as was forced on the electrical industry."

News About Men of the Industry

W. F. Ficklen New President of West Virginia Association

W. Fitzhugh Ficklen, who was elected president of the Public Utilities Association of West Virginia at the recent meeting in Wheeling, has been division manager for the Appalachian Electric Power Company at Charleston for the past two years. Mr. Ficklen's first connection in the electrical industry was with the manufacturing branch in 1910, when he joined the sales department of the Crocker-Wheeler Company, Ampere, N. J., as sales engineer. From 1912 to 1919 he was identified with the Municipal Service Company as manager, first at Staunton, Va., and then at Alexandria. For the past ten years Mr. Ficklen has been associated with the American Gas & Electric Company, first as division manager for the Kentucky & West Virginia Power Company with headquarters at Hazard, Ky., for eight years, then as division manager for the Appalachian Electric Power Company at Charleston for the past two years. He is a native of Virginia and a graduate of Drexel Institute, Philadelphia.

WILLIAM E. LEVERETTE, for several years business manager in the southern division of the Alabama Power Company, has been made merchandising manager of the Broad River Power Company's new merchandising store at Columbia, S. C. Mr. Leverette is a graduate engineer of Harvard University. He removes to Columbia with a number of years of experience in the electric light, power and gas fields. He began work for the Alabama Power Company in 1922.

GARDNER C. GEORGE was appointed superintendent of drafting, New York Power & Light Corporation, with offices at Albany. In this position he will have charge of the drafting and blue printing departments of the company and will report to J. D. Whittemore, executive engineer. Mr. George was graduated from the Massachusetts Institute of Technology in 1911. He then became assistant engineer for the Board of Water Supply, New York City, for two years, going from there to Mexico, where he spent one year as designer on hydro-electric construction for the Mexican Northern Power Company. On retirement from service he became assistant engineer of the State Highway Department in Watertown for three years. From 1922 to 1929 he was chief designing engineer of the Power Corporation of New York at Watertown and from this position he takes up his new position with the New York Power & Light Corporation.

ROBERT A. MONROE, assistant chief of the division of civil engineering of the Pacific Gas & Electric Company, San Francisco, has resigned to enter the hydraulic department of the Aluminum Company of America, with headquarters in Pittsburgh, Pa. Mr. Monroe has been associated with the Pacific Gas & Electric Company for eighteen years, having entered the employ of the company upon graduation from the University of California in 1912. For the past four years he has acted as secretary-treasurer of the San Francisco Section, American Society of Civil Engineers.

F. C. Chambers General Manager of Iowa Utilities

F. C. Chambers, president of the Des Moines City Railway, Des Moines, Iowa, from 1921 until the receivership sale of the property last June, has been appointed general manager of the Iowa Railway & Light Corporation with headquarters at Cedar Rapids. Mr. Chambers entered the public utility field in 1896 in power house work for the Adrian Light, Heat & Power Company of Adrian, Mich. Five years later he removed to the East, where he became chief engineer for the Rome Gas & Electric Company, Rome, N. Y. In 1905 he left Rome to assume the duties of electrical engineer for the East St. Louis & Suburban Railway, and from this time up to the present he has engaged in railway work, which has included connections with the Springfield (Ill.) Consolidated Railway, the County Traction Company, now known as the Chicago & West Towns Railway, Chicago, and more recently with the Des Moines City Railway.

OTTO GRESSENS, who has been doing special work in the office of Britton I. Budd, president of the Public Service Company of Northern Illinois, was recently appointed assistant to the president.

JOHN J. MCKEON, New Haven, Conn., has been elected a director of the Connecticut Light & Power Company to fill the vacancy caused by the death of James W. Hutchings. Mr. McKeon is connected with Charles W. Scranton & Company.

J. B. Hayes Returns to Nova Scotia

J. B. Hayes, who has been manager of the Norfolk division of the Virginia Electric & Power Company, has resigned from that office to become general manager of the Nova Scotia Light & Power Company. Halifax is Mr. Hayes' hometown and he is returning to it after some years of successful operating work with the Stone & Webster organization. He began his career as a Stone & Webster employee with the Nova Scotia property and after spending a year in Boston on the engineering staff he was transferred to Kingston, Jamaica, as assistant manager of the Jamaica Public Service Company. Subsequently he was promoted to the position of manager of the Stone & Webster interests at Fort Madison, Iowa, and after this connection he removed to Virginia in 1925. At first he was assistant to the president of the Virginia Electric & Power Company, but more recently became general superintendent of transportation of the Norfolk division.

HENRY B. BRYANS, formerly assistant general manager of the Philadelphia Electric Company, has been elected vice-president of that company.

MARTIN J. INSULL, president of the Middle West Utilities Company, has been elected president of the United Public Service Company, recently acquired by the Middle West system.

C. T. HUNTER, formerly manager of the Jasper district of the Alabama Power Company, has been appointed division manager of the southeastern division to succeed A. L. Couch, who has been granted a leave of absence.

E. L. ROSE, electrical engineer at Coolidge Dam, Arizona, has left the government service to join the staff of the Massachusetts Institute of Technology, Boston, Mass., as instructor in electrical engineering. CLARK J. WELLS will succeed Mr. Rose as electrical engineer at the dam.

LESLIE R. HICKS has become associated with the electrical construction house of M. J. Daley & Company, Springfield, Mass., specializing in transmission and distribution practice. Mr. Hicks spent the past year in Brazil in electrical engineering service for the Electric Bond & Share Company, and for twelve years prior to that was chief electrical engineer of Charles H. Tenney & Company, Boston, Mass. His earlier career includes two years in the Tenney engineering department, five years as electrical superintendent for the Fall River (Mass.) Electric Light Company and five years with the Aurora, Elgin & Chicago Railway, following a term of service in the testing department of the General Electric Company.

A. P. M. Fleming Receives Institute Appointment

A. P. M. Fleming of the Metropolitan-Vickers Electrical Company has been appointed by the board of directors of the American Institute of Electrical Engineers to be honorary secretary for England for a two-year term expiring late in the year 1931. Fleming's appointment is in succession to C. Le Maistre, whose term has just expired. The local honorary secretaries are appointed under section 46 of the Constitution of the Institute. The duties of the appointment include assisting the board of engineers with regard to applications for membership, extending courtesies to traveling members, and other services. Mr. Fleming was for some time resident in Pittsburgh while in the service of the Westinghouse company and has since visited the United States a number of times. He has extensive knowledge of engineering organizations and has many friends on both sides of the Atlantic.

CHARLES W. KELLOGG, formerly president of the General Public Service Corporation, has been elected chairman of the board of directors and SAMUEL B. TUELL, formerly vice-president of the company, has been elected president to succeed Mr. Kellogg.

KARL VORNHOLT, formerly designing engineer for Stevens & Wood, Inc., for the past five years, has been appointed chief designing engineer of the Pennsylvania-Ohio Electric Company. Mr. Vornholt, who has had a wide experience in the design of electric equipment, was earlier in his career connected with the Madison Gas & Electric Company.

JOHN L. HOLLIS, superintendent at Mitchell Dam for the Alabama Power Company, has been placed in full charge of the Mitchell hydro plant since the resignation of J. U. Benziger, formerly superintendent of Coosa River plants. Mr. Hollis has advanced steadily in the organization since he began work with the Dixie Construction Company on Mitchell Dam in November, 1921. On the completion of that work he entered the service of the production department, advancing to the position of assistant superintendent, and finally to that of superintendent.

PROFESSOR REGINALD A. FESSENDEN, consulting engineer and inventor, has been made the recipient of the Scientific American Gold Medal for promoting safety at sea. Professor Fessenden's contributions to safety at sea include the fathometer, a device for obtaining quick and accurate soundings for vessels, direction finders, electrical and radio devices and compasses. Forty years ago an associate of Thomas A. Edison, Professor Fessenden later taught electrical engineering at Purdue University and Western University of Pennsylvania. More recently he has been connected with the Weather Bureau, the National Electric Signaling Company and the Submarine Signal Company.

J. R. HOOVER, formerly district superintendent of the United Power & Light Corporation at Manhattan, Kan., has been appointed to the position of district manager of the company at Abilene. Mr. Hoover has been with the United Power & Light Corporation since his graduation from Kansas State Agricultural College in 1926. He was appointed to the position of district superintendent a year after he entered the employ of the company.

WILLIAM E. MITCHELL, vice-president and general manager of the Georgia Power Company, has just been elected a member of the board of directors of the Citizens and Southern Bank. In addition to being vice-president of the Georgia Power Company, Mr. Mitchell is vice-president and a director of the Alabama Power Company and Southeastern Engineering Company.

Obituary

Ralph W. Pope

Ralph Wainwright Pope, honorary secretary of the American Institute of Electrical Engineers since 1911, died suddenly November 1 at his home in Great Barrington, Mass., in his eighty-fifth year. The name of Mr. Pope has always been intimately connected with the growth of the A.I.E.E. because it was due to his untiring efforts during more than a quarter of a century as secretary that much of the present strength of the organization is attributed. In 1885, the year following the organization of the Institute, he became its secretary and one year later consented to devote practically all of his time to its interests alone. Perhaps the best evidence of Mr. Pope's achievements is the appreciation shown by the members of the Institute, who elected him twenty-seven times to the office of secretary.

Early in his career Mr. Pope developed a marked taste for mechanics and at the age of 15 he was in the employ of the Housatonic Railroad. Later, while in the service of the American Telegraph Company, he became an expert telegrapher, in 1865 joining the Collins Overland Telegraph Expedition to British Columbia. Subsequently he was identified with the Bankers & Brokers Telegraph Company and with the Gold & Stock Telegraph Company. Mr. Pope was also successful in the field of technical publishing, his first venture in this line of endeavor being as assistant editor of the *Telegrapher*. In 1884 he was associate editor of the *Electrician and Electrical Engineer*, and in 1890, in addition to his Institute activities, he founded the monthly periodical *Electric Power*. In 1891 he became editor for electrical terms of the Standard Dictionary. It was in 1911 that Mr. Pope resigned as secretary of the Institute and was made honorary secretary for life.

DAVID REED, president of the International Association of Municipal Electricians, died at his home in Denver October 25. Since 1899 he had been in charge of the fire alarm systems in that city. He became head of the International Electricians in 1928.

STEPHEN FODOR, Hungarian engineer and friend of Thomas A. Edison, died November 5 in his seventy-third year. Mr. Fodor was ennobled by the Emperor Francis Joseph for his services to science. After the Paris World Exhibition Mr. Fodor became chairman of the Compagnie Continentale Edison, which carried out extensive electrical developments in Russia, Belgium and Holland. He first made the acquaintance of Mr. Edison through an important improvement in the telephone which Mr. Fodor made. When the Edison family visited Hungary in 1911 Mr. Fodor, who was at that time general manager of the Budapest General Electric Company, was their host.

FRANCIS A. J. FITZGERALD, electrical engineer, died at Niagara Falls, Ont., in his sixtieth year. He was a native of Dublin, Ireland, and removing to the United States as a youth entered the Massachusetts Institute of Technology, from which institution he was graduated in engineering. Mr. Fitzgerald began his career in the formation of the Carborundum Company, the success of which was largely due to his researches. In 1900 he was one of the founders of the Acheson Graphite Company, Niagara Falls, N. Y. He subsequently engaged in practice as consulting engineer, and in 1910 removed to Niagara Falls, Ont., where he continued to reside until the time of his death, holding retainers from many large engineering companies in Canada and the United States. More recently he was engaged in researches looking to the discovery of a process for the commercial utilization of low-grade iron ores. He was a member of the American Electrochemical Society, the American Institute of Electrical Engineers and other technical organizations and had received degrees from many universities in recognition of his scientific attainments and discoveries.

Financial and Statistical News

THE BOND MARKET is illustrating the "no ill wind" adage these days. Utility bonds, except convertibles, have shown decided strength under active institutional and private buying. Many convertible issues reflected the selling off of their related common stocks.

——WHETHER OR NOT THE MARKET CRASH has seriously interfered with new financing possibilities for the next few weeks is warmly discussed. There is a large volume of financing to be done this month and next. It seems generally agreed that any large volume, at least of common stock financing, is not likely to find the market especially favorable for a while.

——HEAVY SELLING IN THE MARKETS this week is generally attributed to the turning back of stock acquired by banking interests to halt the frenzied selling recently. The utilities were again unloaded in large volume and both holding and operating company stocks sold off several points.

August Customer-Ownership Sales $18,500,000

August sales of stock sold on the customer-ownership plan amounted to $18,500,000, the number of shares sold was 278,900 and the number of transactions 23,800, it is estimated on the basis of reports received by the ELECTRICAL WORLD from central-station companies selling stock directly to customers, employees and other local parties.

Although this value is below the total of the previous month by nearly $3,000,000 it shows a decided increase compared with sales of $7,390,000 during August, 1928.

Approximately $12,000,000 of the whole value was in the form of $100 shares, the balance being shares selling at prices from $25 to $50. The average price per share was $66. The average value of the transactions was higher than any month thus far this year, amounting to $777. This was partly due to one large company selling $8,500,000 of stock in 6,385 transactions.

Canadian Company Floats $11,000,000 Issue

First mortgage gold bonds to the amount of $11,000,000 were offered by the Gatineau Power Company during the last week of October at 93 and accrued interest to yield about 5.50 per cent. These securities, dated June 1, 1926, mature June 1, 1956. They are secured by a direct first mortgage on all water powers operating or in process of development now owned by the company, except four small powers with a total installed capacity of less than 6,000 hp. The major portion of the proceeds of this issue will be applied to the acquisition of first mortgage bonds of the St. John River Power Company and the balance will be used to reimburse the company for expenditures made or to be made for capital purposes, including construction of the Cabonga storage reservoir and additions to the transmission system.

The Gatineau Power Company is the principal Canadian operating subsidiary of the International Hydro-Electric System. Its hydro-electric plants on the Gatineau River and on the Ottawa River and tributaries have a present installed generating capacity of 562,600 hp., of which 436,000 hp. is in three plants located on the Gatineau River within 35 miles of the city of Ottawa.

Daily Fuel Output Breaks Records

The output of public utility power stations, including electric railway plants, was 10 per cent greater in September this year than a year ago, attaining a total of 7,997,814,000 kw.-hr., according to the U. S. Geological Survey.

The average daily production was 266,600,000 kw.-hr., practically the same as the all-time record rate established during August of 267,300,000 kw.-hr. Of the total, 2,479,066,000 kw.-hr. came from hydro-electric plants and 5,518,748,000 kw.-hr. from fuels.

The continued dry weather during September decreased the stream flow and consequently the output of hydro-electric plants, which contributed only 31 per cent of the total. This is the lowest ratio since October, 1925. Compared with September, 1928, the output produced by water power was 12 per cent less, while that from fuel was 23 per cent greater. The average daily output from the latter source exceeded that of any previous month. Interstate connections were apparently used to the full. Water-power states generated energy less than last year; those well provided with fuel-burning plants supplied the deficiency.

Insull System Sells More Common Stock to the Public

THAT the Middle West Utilities system aims to get more common stocks in public hands was expressed by Martin J. Insull at a five-day conference of executives of the system. Mr. Insull said in part:

"Whereas at the end of 1928 the amount of common stock was approximately 8 per cent of the total securities of the system held by the public, at the end of 1929 this percentage, due to the Middle West Utilities Company refinancing and other financing, will be approximately 20 per cent.

"Our policy has never been one of milking our operating companies, but rather one of nursing them. Our policy of financing our operating companies with 50 per cent of bonds, 25 per cent of preferred stocks and 25 per cent of common stock, the latter being paid for by the holding company, bears this out.

"If the operating companies were financed for the benefit of the holding companies the amount of the bond and preferred stock issues would be much greater and that of the common stock issues much less.

"This would require far less money from the holding companies for common stock and the earnings per share on the common stock held by them would be considerably larger. But the financial strength of the operating companies would be very materially weakened.

"The reorganization of the financial structure of the Middle West Utilities Company, now in process, was planned with this in view, as the parent company's financial structure is necessarily the broad foundation upon which the finances of the subsidiaries must rest. Including its securities with those of its subsidiary holding and operating companies, the system as a whole has very nearly $1,000,000,000 of securities in the hands of the investing public. The responsibility for the integrity of these securities that represent the savings of probably more than 500,000 people rests on us.

COMMON STOCK THE FOUNDATION

"The whole financial structure of the system necessarily rests upon the foundation of common stocks in the hands of the public and the financial strength of the structure will necessarily depend largely on what percentage common stocks bear to the total capitalization. As it is our policy to keep in the treasury of the holding companies all the common stock of the operating companies, this foundation must necessarily be the common stocks of the holding companies

sold to the public. The whole plan of the refinancing of the Middle West Utilities Company had this in view. By calling notes, prior lien and preferred stocks and replacing them to a considerable amount by common stock we have increased and strengthened the foundation, and reduced the structure that rests upon it."

Italy's Output Grows 12.5 per Cent

Italy's electrical industry is progressing as rapidly as that of the United States. Hydro output of stations reporting to the National Fascist Electrical Industry Union (the "UNFIEL") in 1928 was 13.8 per cent greater than in 1927; thermal was reduced 26.5 per cent, leaving a net gain of 12.5 per cent.

The country's total energy production in 1928, including the electrical equivalent of mechanical energy used directly, expressed in millions of kilowatt-hours, was as follows:

	Hydro	Thermal	Total
Electrical Establishments:			
(a) Reporting to "UNFIEL"	*8,432	179	*8,611
(b) Not included in census (est.)	1,358	32	1,391
Private use and equivalent of mechanical power applied directly	1,030	540	1,510
Total	10,820	751	11,512

*Includes imports, 229

The estimated allocation of energy consumption (1928), also in millions of kilowatt-hours, is shown in the next table:

Lighting, private	735
Lighting, public	150
Lighting, total	885
Industrial:	
Produced by industries	725
Sales, small power	1,000
Sales, large power	3,500
Sales, electrochemical, etc	800
Traction	770
Total industrial	6,795
Grand total	7,680

Thus the estimated losses are about 30 per cent. The large ratio is explained by the long transmission distances involved in utilizing water power and the various energy transformations between generation and ultimate application.

These statistics are taken from a recent publication by the Italian Government entitled "La Produzione e l'Impiego dell' Energia in Italia nell' Annata 1928," reprinted from the August issue of the monthly review *L'Energia Elettrica.*

Recent Listings

The New York Stock Exchange has authorized the listing of 75,000 additional shares of common stock (no par) of the Electric Power & Light Corporation and 40,000 additional shares of preferred stock, no par value, on official notice of issuance in exchange for securities of subsidiary companies and those of other utility companies, making the total amounts applied for 2,614,109 shares of common stock and 589,181 shares of preferred stock. The exchange has also authorized the listing of 90,000 additional shares of 6 per cent cumulative preferred stock of the West Penn Power Company, making the total amount of 6 per cent cumulative preferred stock applied for 150,000 shares. There have been placed on the Boston Stock Exchange list temporary certificates for 916,163 shares, no-par value common stock of the Hydro-Electric Securities Corporation.

Italian Edison Shares to Be Offered

An offering of approximately 140,000 American shares of the Edison General Italian Electric Company of Milan, comprising the American portion of 500,000 additional shares, which are being marketed to increase the capital of the company from $57,750,000 to $70,875,000, will be made shortly by the National City Company.

The Edison General Italian Electric Company (Società Generale Italiana Edison di Elettricità) produces 25 per cent of all the electrical power generated in Italy. It operates in the northern part of Italy and derives its electricity principally from hydroelectric sources.

The increase in capitalization was authorized by stockholders of the company recently. The funds will be used principally for hydroelectric developments. The governing committee of the New York Stock Exchange yesterday approved the admission to dealings on a when-issued basis of temporary certificates for 140,000 American shares of the Italian Edison Company, and authorized the listing of temporary certificates upon notice of issuance and of permanent certificates on official notice of issuance in exchange for temporary certificates.

Public Service Commission Hears Two Valuation Plans

Chairman Prendergast of the New York Commission and Dr. John Bauer Urge More Accurate Finding of Rate Base

TWO plans came before the Public Service Commission of New York State last week dealing with the more accurate fixation of a rate base. One, that suggested by Chairman Prendergast, was previously presented at a meeting of the public service commissions of various states in January, 1928. The other is suggested by Dr. John Bauer, utility expert, acting for the committee currently investigating the workings of the New York State Public Service laws.

Summary of Chairman Prendergast's Plan

1. Fixation of a rate base.

A rate base should be ascertained as of December 31 and made effective for a period of at least two years (such period being long enough for an equitable trial and short enough to prevent, in all ordinary cases, irrevocable damage to those interested).

The determination of this rate base to contemplate two distinct operations:

(a) Determine the book value of all fixed capital in existence and used in the business, say on December 31, 1927. From an examination of the books separate the dollar figures into two groups, (1) those elements (including overheads) installed up to and including December 31, 1917, and (2) those elements (including overheads) installed subsequent to that date. Eliminate all items of land and working capital. Apply to the resultant figures in the first group a proper price index figure based on the index of the United States Bureau of Labor Statistics to bring such book cost figures to 1927 dollars. Add to the result obtained the dollar figures of all property installed since December 31, 1917, at its actual book cost. Deduct such actual observed deterioration as is discoverable upon inspection.

(b) To such valuation figure add land values at December 31, 1927, prices and proper amounts for working capital and going value. These three items to be treated as facts to be proved by the utility and determined by the independent judgment of the regulatory body, as of the date of valuation. The final figure gives a fair and equitable basis on which a return may be earned and one which it is believed would be considered as just and reasonable by all three parties in interest.

(c) In case where no overheads are found upon the books, or where the utility may demonstrate by adequate proof that overheads additional to those charged should properly be considered in the rate base, this issue is also to be determined under the same circumstances as the figures representing land values, working capital and going value.

2. Fixation of rates and rate of return:

Apply a reasonable percentage figure for rate of return, say, 7 per cent, to this rate base and at once determine a schedule of rates for the product or service furnished, after strict scrutiny of all expense items, which will allow such net return. Include in the rate order an exception permitting rate revision as of January 1, two years from date and biennially thereafter. The purpose of the exception in the rate order, and it is an inextricable part of the suggested system, is that the utility be directed to show on the biennial date any reduction in rates.

3. Treatment of depreciation and depreciation reserves:

Apply to every company of sufficient size (this will include all except small local utilities and those such as water companies whose fixed capital largely consists of a few large items of physical property), the replacement system of depreciation accounting.

In most large properties major retirements tend to become fairly well distributed; that is, they do not occur so as

to produce a marked fluctuation in net revenues if charged in the year of occurrence. It is recognized that in a small plant the replacement of a single large unit might entirely wipe out the net income if charged in a single year; and this is provided for. The replacement method requires that those to be benefited by the replacement will pay for it, and does not saddle the present with the burdens of the future. It does not allow excessive charges to the consuming public to build up reserve funds for the future, tend to extravagance of operation, nor offer a way of giving unreasonable dividends to common stockholders by some form of distribution of such funds. In addition it does not depend on the speculative opinion of divining experts as to life history.

Authorize the accumulation of a contingent reserve at the rate of, say, 1 per cent per annum on base value of physical properties: (see [a] and [b] above), to be accumulated for three, four or five years (dependent on the special situation and local circumstances, such time to be fixed by the independent judgment of the regulatory body after proof of the facts). This reserve fund to be used only for true obsolescence, extraordinary inadequacy and unanticipated repairs caused by natural catastrophes, and in no event except upon the express order of the regulatory body. Such fund to be deducted from the rate base in the biennial fixation thereof and at the option of the utility to be invested as an interest-bearing fund or in its plant and property.

Summary of Dr. Bauer's Plan

He would distinguish between present properties and future investments in additions, extensions and improvements. With respect to all future investments, there should be an explicit statement of legislative policy that the return shall be based upon the actual additional investment in property. This would be a definite sum and would be shown by the accounts, subject to commission supervision. If the law clearly stated that the investors would be able to get a return on no greater amount, but that they would be assured through the rate-making process of obtaining the specified return, there could be no question as to the constitutional validity of this provision. The statute would provide that such investment should be fully maintained and safeguarded for the investors.

With respect to existing properties the legal problem of establishing a fixed rate base is more difficult. Under present conditions the companies do have a right to the fair value of the properties, which may increase or decrease as the price level or the cost of construction changes. The question is whether, on the ground of public policy, such a variable rate base can be converted into a fixed and non-variable quantity through legislative action —for the purpose of effective administration and sound financial dealing with the utilities.

To meet this situation with respect to existing properties the Legislature should provide a valuation as of a given date for every property along the line of the railroad valuation by the Interstate Commerce Commission. The valuation should be fair and reasonable in every respect. In general, under present conditions it should be based upon the reproduction cost less depreciation of the properties, with such further adjustments as may be reasonable or necessary in fairness to both the public and the companies. The purpose would be to resolve all uncertainties once for all, and then take the results upon the books of the companies. The quantities would be subject to no further variation, upwards or downwards, due to change in price level or cost of construction. They would be fully maintained through charges to operating expenses for maintenance and depreciation. They would be subject to increase only as actual additions are made to the properties, subject to the commission's approval.

The entire policy and procedure should be explicity provided for by statute, based upon stated reasons of administrative and financial requirements. After the initial valuation, the commission would have a definite rate base for every company—shown constantly by the accounts. The rights of the investors and the public would be exactly stated for the purpose of rate adjustments.

Dr. Bauer proposes also that definite rate of return should be fixed for each company upon the fair value as determined for the existing properties. This rate might, in general, be 7 per cent, but should be sufficiently flexible so as to be really fair in each instance. Upon the additional investment following the initial valuation, the rate of return would be fixed automatically by market conditions as securities are issued for capital purposes. At each step as capital funds are required, the market rate would have to be paid. This would be exactly determined as securities are issued.

The total return to be provided for by the rates would thus be a definite quantity, subject to accounting control of the commission. Rates would be promptly adjustable, so as to provide the returns to which the companies would be entitled and to furnish constant protection to the public. An exact yard-stick to measure the return would be provided by direct legislation.

R. H. Ballard Makes Forecast

GROSS EARNINGS of the Southern California Edison Company for 1929 will be $5,219,000 more than the total of $35,281,000 for 1928, according to a forecast made by R. H. Ballard, president. The gain is about $2,000,000 more than was anticipated at the first of the year. In making this forecast Mr. Ballard pointed out that the $40,500,000 1929 gross total takes into consideration the company's voluntary reduction of 10 per cent in lighting rates and in the wholesale rate which it has made effective to the city of Los Angeles as of November 1. A similar reduction in industrial rates for the system goes into effect January 1, 1930.

"The company will continue to maintain its position of ability to serve all demands of southern California, and with the settlement of the Boulder Canyon power question on the co-operative basis one may express no other opinion than that the next ten years will be a decade of great prosperity for the southern California community as a whole and the company as well.

"The past decade," said Mr. Ballard, "has been one of remarkable electrical development, particularly in this territory. The company's expenditures for increased plant investment were over $218,000,000, an increase of 256 per cent for the ten years. The company's kilowatt-hour sales rose from 750,310,000 in 1920 to 2,493,000,000. In other words, the sales of energy for the last year were 3⅓ times those of the year 1920. Gross earnings during the same period increased from $14,647,000 to $38,860,000.

"The present earnings in dollars are 2⅔ times those of the year 1920, as compared with 3⅓ times increase in kilowatt-hour sales, demonstrating the effect of rate reduction during the period.

"The company's hydro-electric and steam-power generating plants have been enormously increased during this decade and they include some of the largest operating units in existence anywhere. The company's distributing lines have been extended to all parts of the territory served, and with the new uses to which electricity is being applied this territory has just begun to earn.

"The next decade should be one of continued remarkable electrical development, new industries and all classes of new consumers coming on the company's existing lines, and these lines will be freely extended as new territories may be developed.

"The sales feature will far outrun the investment requirements, since so much of the foundational investment in plants and lines is already made. This will result in larger proportional earnings, greater operating efficiencies, and further rate reductions to the consuming public from time to time."

Nearly 3,000,000 Hp. in Italian Industry

Electric motors in Italian industry and commerce, including reserve, number 373,169 and have a total rating of 2,899,382 hp. (1927). The textile industry has 508,216 hp., metallurgical 465,619, mechanical, including iron and steel products, 401,542, and the food industries 337,633 hp. Thermal engines have 1,084,419 hp., of which only 745,080 hp. is steam; half the balance is heavy oil, the remainder on volatile oil and gas.

WESTERN UTILITY FORMS NEW COMPANY TO SELL STOCK.—The California Oregon Power Company, Medford, Ore., has created a subsidiary, the California Oregon Power Securities Company, as a medium through which customer-ownership sales of the power company's 6 per cent preferred stock at $101 will be handled.

U. G. I. NEW ON $1 BASIS.—United Gas Improvement Company has declared an initial quarterly dividend of 25 cents on the new common stock, placing the issue on a $1 annual basis, equivalent to $5 on the old stock, recently split five for one. The old common stock was on a $4.50 annual dividend basis. An initial quarterly dividend of $1.25 on the new preferred stock was also declared, both dividends payable December 31 to stock of record November 30.

Business News and Market Conditions

Electrical Goods Ordered Decline in Third Quarter

New orders for electrical goods booked during the third quarter of 1929 as reported to the Department of Commerce by 81 manufacturers were $336,806,037, as compared with $340,898,469 for the second quarter of 1929 and $264,466,257 for the third quarter of 1928. The accompanying totals of bookings for each quarter since the beginning of 1927 include motors, storage batteries, domestic appliances and industrial equipment, and are presented, not as a complete statement of the industry, but as probably sufficient representative to indicate the trend.

Quarter	1927	1928	1929
First	$235,883,303	$237,508,001	*$322,424,619
Second	229,353,332	245,520,801	340,898,469
Third	228,610,346	264,466,257	336,806,037
Fourth	232,877,670	282,226,449	.....
Total	$926,724,651	$1,029,721,508	.....

*Revised.

Delinquent Electrical Accounts

NUMBER OF ACCOUNTS REPORTED

Division	September 1928	September 1929	Per Cent Change	Eight Months 1928	Eight Months 1929	Per Cent Change
New York	245	224	— 8.5	2,669	2,256	—15.4
Middle and Southern Atlantic	197	184	— 6.8	1,726	1,489	—13.6
New England	159	91	—42.7	1,194	1,224	+ 2.3
Central	819	618	— 0.16	6,897	5,654	—18.0
Total	1,220	1,117	— 8.4	12,486	10,623	—14.9

TOTAL AMOUNTS REPORTED

	September 1928	September 1929	Per Cent Change	Nine Months 1928	Nine Months 1929	Per Cent Change
New York	$33,904	$38,063	+ 6.0	$383,942	$494,356	+28.7
Middle and Southern Atlantic	23,135	14,069	—39.2	219,580	201,861	— 8.7
New England	17,754	11,335	—36.1	146,359	171,455	+17.1
Central	65,844	66,592	+ 1.1	814,154	681,216	—16.3
Total	$140,637	$122,059	— 8.9	$1,564,035	$1,548,888	— 0.96

Tariff on Incandescent Lamps

On November 2 the United States Senate took up the matter of tariff rates on incandescent bulbs and lamps and made certain tentative changes. The duty on lamps with metal filaments was placed at 25 per cent ad valorem and the duty on those having carbon or other non-metal filaments 30 per cent. The present duty is 20 per cent on all with filaments and this was raised by the House to 30 per cent.

The Senate recommendations provided for different rates for lamps with metal and non-metal filaments. These rates included a specific duty of 1 cent each on those with non-metal filaments.

Imports of Electrical Apparatus Into the United States—August, 1929

(Preliminary Figures—Values in Dollars)

Article	Number	Value
Electric lamps:		
Incandescent—		
Miniature carbon filament:		
Austria	200	$6
Germany	199,500	6,579
China	13,100	427
Japan	3,892,697	106,921
		$113,933
Other carbon filament:		
Austria	9,500	1,363
France	1,644	272
Germany	22,220	1,839
Netherlands	125	18
Japan	347,235	14,612
		$18,104
Miniature metal filament:		
Germany	4,200	132
Japan	362,900	6,981
		$7,113
Other metal filament:		
France	527	111
Germany	40,192	235
Italy	100	87
Japan	210,355	6,397
		$6,830
Other, including neon, mercury and medical—		
France	57	119
Germany	385	544
Japan	288	93
		$756
Generators:		
No imports		.....
Transformers:		
No imports		.....
Converters, double-current and motor-generators, dynamotors, and other converting apparatus:		
Germany		1,629
		$1,629
Switches, circuit breakers, fuse choke coils, reactors, sockets, cut-outs, attachment plugs, and other distributing apparatus:		
France		28
		$28

Article	Number	Value
Motors, stationary, railway, vehicle, automotive and other:		
Germany		17
		$17
Electric fans and blowers:		
No imports		.....
Table, household, kitchen and hospital utensils, and similar hollow or flat ware, n.s.p.f., containing electrical heating elements:		
Electric flatirons—		
No imports		.....
Iron or steel enameled or glazed with vitreous glasses—		
No imports		.....
Aluminum—		
No imports		.....
Copper, brass, steel, or other base metal—		
No imports		.....
Industrial electric furnaces and ovens:		
No imports		.....
Therapeutic apparatus and x-ray machines:		
Japan		2,964
		$2,964
Radio and wireless apparatus and parts:		
Germany		4,087
Netherlands		252
United Kingdom		7,075
Canada		795
		$12,209
Telegraph apparatus, not elsewhere specified:		
Germany		1,446
Netherlands		150
United Kingdom		1,003
		$2,599
Telephone apparatus, not elsewhere specified:		
No imports		.....
Spark plugs, except automobile:		
No imports		.....
Storage batteries and parts, n.s.p.f.:		
Germany		223
Canada		117
Japan		11
		$351
Batteries other than storage:		
Austria		26
Canada		154
		$180

Article	Number	Value
Electrical machinery and parts, n.s.p.f.:		
Austria		485
France		4,266
Germany		20,665
Norway		64
Sweden		39
Switzerland		16,943
United Kingdom		571
Canada		212
Japan		387
		$43,632
Electric apparatus and parts, n.s.p.f.:		
Austria		773
France		337
Germany		3,004
Sweden		8,556
United Kingdom		6,173
		$18,843
Total		$229,188

BY COMMODITIES

Values in Dollars

Article	Value
Electric lamps:	
Incandescent lamps, carbon filament—	
Miniature	$113,933
Other	18,104
Incandescent lamps, metal filament—	
Miniature	7,113
Other	6,830
Other electric lamps	756
Converters, double-current and motor generators, dynamotors, and other converting apparatus	1,629
Switches, circuit breakers, fuse choke coils, reactors, sockets, cut-outs, attachment plugs, and other distributing apparatus	28
Motors, stationary, railway, vehicle, automotive and other	17
Therapeutic apparatus and x-ray machines	2,964
Radio and wireless apparatus and parts	12,209
Telegraph apparatus, not elsewhere specified	2,599
Storage batteries and parts, n.s.p.f.	351
Batteries other than storage	180
Electrical machinery and parts, n.s.p.f.	43,632
Electric apparatus and parts, n.s.p.f.	18,843
Total	$229,188

Market Conditions

STOCK MARKET liquidation seems to have halted prospective industrial business in electrical equipment in many parts of the country, at least temporarily. Such is reported to be the case on the Pacific Coast, although central-station business is substantial.

——POWER COMPANY ORDERS ARE KEEPING BUSINESS up to normal in the Southeast and Southwest. Distribution equipment is active.

——LESS ACTIVITY IS REPORTED IN INDUSTRIAL EQUIPMENT in New England, though motor sales are steady.

——STRONG DEMAND FOR DIVERSIFIED APPARATUS continues in the East.

EASTERN

BUSINESS in electrical equipment shows no change in the Eastern district; there is a strong demand for diversified apparatus, with both central stations and industrials in the market.

INQUIRIES show an upward trend and with holiday call now about to expand, the remainder of the year is expected to round out record sales.

ELECTRIC railway account is easing, but this is offset at present by the increased orders for industrial installations.

Power company purchases are an important factor in current commitments and incoming inquiries point to early contracts for a heavy quota of transmission line apparatus. A central station in New Jersey has placed an order for a quantity of synchronous condensers with a New York manufacturer to cost about $100,000. A Northern New York power company has closed for transformers and auxiliary equipment to cost approximately $75,000. A power interest in Oklahoma has given a contract for a turbo-generating unit and has also placed an order for boilers and superheaters with an Illinois maker. A metropolitan central station has purchased a quantity of switchgear, lightning arresters and allied apparatus to cost about $27,000. A manufacturer of heavy electrical machinery says that sales are from 5 to 10 per cent in advance of those a year ago at this time. A maker of transformers reports a heavy volume of orders on hand, with indications bright.

Industrial call has a strong tone. Iron and steel mills are placing some sizable commitments for heavy type mill motors, controls and affiliated equipment; metal-working plants are purchasing motors in good volume. Chemical plants show expansion in demand for electrical equipment, and leather and shoe factories indicate an improved buying condition. A manufacturer of motors reports an active call from laundry machinery producers, and with gross demand from all industrial account showing an increase of 20 per cent in commitments as compared with this period last year. A manufacturer of wire rope, cable, etc., in New Jersey has given an order to a New York maker for motors, transformers, switchgear and kindred equipment to cost $45,000. The demand from radio manufacturers holds strong; a New Jersey producer has purchased a quantity of molded compound for panel board service to an amount of $75,000. A Northern New York manufacturer of cranes and hoisting equipment says that demand is excellent, although it has shown a tendency to ease off for the past few weeks; current business is running about 20 per cent in advance of sales at this time in 1928. Electric railway business continues to record sizable transactions. The J. G. Brill Company, Philadelphia, Pa., has closed with the Chesapeake Beach Railway for a gasoline-electric rail-motor car, and other orders of this character are anticipated at an early date. Airport lighting apparatus is operting under an expanding call and there is noticeably good business in this line. Street-lighting apparatus is in good demand. Manufacturers of electric heating and cooking specialties show improved account.

CONSTRUCTION PROJECTS

Chevrolet Motor Company, Detroit, Mich., has plans for an addition to plant at Tarrytown, N. Y., to cost $200,000. Nichols Copper Company, New York, has approved plans for a power plant at refining works at El Paso, Tex. Quisenberry Feed Manufacturing Company, Buffalo, N. Y., will build a plant and grain elevator to cost $100,000. Irving Air Chute Company, Buffalo, N. Y., has approved plans for plant at Glendale, Calif., to cost $100,000. Prest-O-Lite Company, New York, will build a plant at Casper, Wyo., to cost more than $100,000, and also plans plant at Jacksonville, Fla., to cost about $50,000. National Biscuit Company, New York, has filed plans for a plant at Newark, N. J., to cost $450,000. Simmons Bed Company, Kenosha, Wis., has filed plans for a multi-story factory branch and distributing plant at Syracuse, N. Y., to cost more than $100,000. Sun Oil Company, Philadelphia, Pa., will build a storage and distributing plant at Tonawanda, N. Y., to cost $200,000. The Board of Education, New York, has plans for a power house in connection with institutional building at Jerome Park Reservoir, entire project to cost $700,000. Beckwith-Chandler Company, Newark, N. J., will build an addition to chemical plant to cost $100,000. Tung Sol Lamp Works, Inc., Newark, N. J., has taken bids on general contract for addition to radio tube manufacturing plant to cost $200,000. F. G. Vogt & Sons, Inc., Philadelphia, is asking bids until December 2 for meat-packing and refrigerating plant to cost about $1,000,000. Bethlehem Steel Company, South Bethlehem, Pa., has authorized an expansion and improvement program at branch plant at Baltimore, Md., to cost $25,000,000. Gimbel Brothers, Inc., Philadelphia, Pa., has filed plans for an automobile service, repair and garage building to cost $180,000. Polk State School, Polk, Pa., will receive bids until November 15 for extensions and improvements in power plant at institution to cost about $75,000. Mutual Telephone Company, Erie, Pa., will build an equipment storage and distributing plant to cost $180,000. Philadelphia Quartz Company, Philadelphia, Pa., contemplates a plant at Baltimore, Md., reported to cost more than $200,000. Levering Brothers, Baltimore, Md., has plans for a foundry at Hanover, Pa., to cost $100,000. Rustless Iron Corporation of America, Baltimore, Md., contemplates plant at Pittsburgh, Pa., reported to cost more than $250,000. Chief of Engineers, United States Army, Washington, D. C., will receive bids until November 27 for three 100-kw. Diesel engine generating sets, one station switchboard and spare parts (Circular 6). General Purchasing Officer, Panama Canal, Washington, will receive bids until November 20 for four two-panel switchboards, electric fixtures and supplies (Panama Canal Schedule No. 2505). Quartermaster, Marine Corps, Washington, will receive bids until November 12 for one refrigerating unit, (Schedule 412.)

SOUTHWEST

DURING the unusual condition of the stock market last week orders for medium sizes of apparatus almost stopped, but after two or three days the volume has been entirely normal.

MERCHANDISE of odd classes is being moved out in good quantity.

Contracts closed included a 500-kva. generator for steam engine connection, costing $9,000. A subcontractor on a large water-power development in Missouri bought four generators of 450 kva. each for Diesel connections, a lot of motors and a switchboard to cost $20,000. They will be used on sand and gravel dredges and washing plant. A local power company bought switchboard and lightning arresters costing $27,000. Another order was for two generators about 380 kva. capacity for connection to Diesel engines, costing $7,000, and equipment for "white-way" installation in an Illinois town totaling $7,000.

CONSTRUCTION PROJECTS

International Shoe Company, St. Louis, Mo., will soon begin erection of a four-story addition to cost about $100,000. Missouri-Pacific Railway Company, St. Louis, Mo., plans engine house and shop addition at repair plant at Atchison, Kan., to cost $150,000. Kansas Gas & Electric Company, Wichita, Kan., plans equipment storage and distributing plant, and general service building to cost $400,000. Blackwell, Okla.,

plans extensions and improvements in municipal electric light and power plant, including installation of additional equipment. Fairview, Okla., plans expansion and improvements in municipal power plant and system. Houston Compress Company, Houston, Tex., plans an addition to cost $60,000.

Middle West

GENERAL business in the Middle West section continues to show improvement and the volume of business is holding up well, with every promise of continuing during the remainder of the year.

MAJOR activities, steel, railroad, agricultural and automotive industries, are in a satisfactory position, although some slight recessions in the volume of business of the steel and automotive industries are being noticed.

UTILITY companies are busy with a certain amount of construction work, while there has been a steady demand for apparatus and distribution equipment.

Some of the interesting orders placed this week include switching and switchboard equipment valued at $1,225,000, high-pressure and reheat steam piping to cost $160,000, high-pressure check, globe and blow-off valves $30,000, nine patent automatic coal scales, coal-conveying equipment to cost $25,000, erection of structural steel to cost $100,000, one 175,000-cu.ft.-per-minute air filter, 62 96-kva., 2,400-volt, 60-cycle, single-phase, 10 per cent boost or buck automatic induction feeder regulators. Jobbers' sales show a normal amount of increase. It is expected that the year's business will exceed last year's figures by a substantial margin and that better business may be expected. Prices remain generally firm.

CONSTRUCTION PROJECTS

Eau Claire Baking Company, Eau Claire, Wis., has filed plans for plant to cost $100,000. Tomahawk Craft Paper Company, Tomahawk, Wis., is reported planning an addition to cost more than $85,000. Monroe Steel Castings Company, Monroe, Mich., will build an addition to cost about $90,000. Hardinge Brothers, Inc., Chicago, Ill., plan addition to oil burner equipment manufacturing plant to cost $150,000. Merit Hardware Manufacturing Company, Chicago, Ill., contemplates an addition to cost about $300,000. Ostrander-Seymour Company, Chicago, Ill., has filed plans for an addition to photo-engraving machinery manufacturing plant to cost $60,000. Pure Oil Company, Chicago, Ill., is reported planning oil refinery in Mount Pleasant, Midland County, district, to cost more than $500,000. Schlangen Brothers Company, Chicago, Ill., plan addition to hardware manufacturing plant to cost $200,000. Sundstrand Machine Tool Company, Rockford, Ill., plans an addition to cost more than $80,000. Hoosier Desk Company, Jasper, Ind., plans power plant in connection with factory addition, entire project to cost more than $90,000. United States Radio & Television Company, Chicago, Ill., will build a plant at Marion, Ind., to cost about $75,000. Canton Rolling Mill Company, Canton, Ohio, will make extensions and improvements in plant to cost $500,000. Central Alloy Steel Corporation, Canton, Ohio, will carry out an expansion program to cost $500,000. Acme Refining Company, Cleveland, Ohio, plans a grease and oil plant to cost $140,000. Cleveland Wax Paper Company, Cleveland, Ohio, plans an addition to cost about $65,000. Tuscan Tire & Rubber Company, Carrollton, Ohio, is reported planning rebuilding of portion of mill recently destroyed by fire with loss of more than $350,000. Frigidaire Corporation, Dayton, Ohio, plans addition to electric refrigerator manufacturing plant to cost about $50,000. Cowan Potters, Inc., Rocky River, Ohio, plans an addition to art ware pottery to cost more than $70,000. Electric Auto-Lite Company, Toledo, Ohio, plans an addition to cost about $1,000,000. Toledo Scale Company, Toledo, Ohio, plans an addition to cost in excess of $100,000. Austin and Columbia Heights, Minn., plan ornamental lighting systems. Minneapolis, Minn., plans installation of floodlighting system and beacon lamps at municipal airport. Minnesota Mining & Manufacturing Company, Minneapolis, Minn., is building an addition to cost $150,000. R. S. Cobb Company, St. Paul, Minn., plans power plant at proposed produce building, entire project to cost $140,000. Powell River Company, Minneapolis, Minn., plans hydro-electric power plant and paper mill on Vancouver Island to cost more than $6,500,000. Swift & Company, Chicago, Ill., meat packer, plan ice-manufacturing plant at Ashland, Neb., to cost $50,000. Iowa-Nebraska Light & Power Company, Lincoln, Neb., will build a power plant addition on local site to cost $110,000. Spencer, Iowa, plans extensions in municipal electric light and power plant, with installation of additional equipment, to cost about $50,000. Rollins Hosiery Company, Des Moines, Iowa, will soon take bids for an addition to cost $100,000.

New England

RECENT orders for electrical equipment include a number of power control lots of fair size circuit breakers, oil switches, bus supports and steel structures for outside control.

LESS ACTIVITY is reported in industrial equipment though motor sales are steady.

MERCHANDISING is steady and encouraging in view of unsettled market conditions.

During the past week a prominent Maine power company placed orders for oil switches and circuit breakers amounting to over $100,000, steel bus supports totaling over $5,000 were also placed, small orders for insulators were steady and closing up of central-station orders for general scheduled materials were numerous. Industrial equipment buying was spotty, but motor sales, on the other hand, are well up in comparison with previous weeks. Heavy industrial equipment is attracting interest; electrical industrial heating equipment inquiries are steadily mounting in volume; sales are marking time, but indications for later buying are promising.

Recommendations for several notable installations of electrical controlled traffic signals were recently passed in this district; the city of Boston will add installations which will cost about $100,000; one manufacturer reports a very active interest in floodlights, spot type lights and appurtenances used for traffic control. Less interest is reported in new construction materials, merchandising maintains a steady level in volume. Irons, portable lamps and table domestic appliance sales are ahead of last year, according to one manufacturer.

CONSTRUCTION PROJECTS

General Ice Cream Company, Cambridge, Mass., has filed plans for extensions and improvements in plant to cost $70,000. Narragansett Electric Company, Providence, R. I., plans power substation in eastern part of city to cost $500,000. Connecticut Light & Power Company, Waterbury, Conn., plans power substation to cost about $50,000.

Pacific Coast

MUCH prospective industrial business is reported dormant, due to stock market conditions.

POWER company business is fair in northern California, and good in southern California.

DEALERS are working normal crews, but will have to cut them after completing present jobs unless prospective business improves.

ANTICIPATED buying from lumber mills in the Puget Sound district is slow in materializing; last week's movement was very light.

Transformer business is outstanding. Westinghouse reports a $15,000 sale of distributing sizes to an Idaho company and $100,000 worth of 3,000-kva. sizes to a southern California company. San Francisco offices report a weekly total of 300, which is 50 per cent over the normal seasonal sale for distributing sizes. Switchboard sales include a panel for Stanford University and an $8,000 steel switchboard panel for a Portland paper plant. Heater business is still hampered by a spell of 85-deg. weather, but the Pacific Gas & Electric Company is perfecting a selling organization for a 20,000-heater campaign this winter. Interesting orders include one-half carload of copper wire to a railroad, a $10,000 pole digger to a power company, one carload each of pole line hardware to a railroad and a power company, excellent orders for holiday holloware from many dealers, a $12,000 electrical contract for a San Francisco high school and electric traffic signals for Redwood City and San Leandro. Prospective business includes such unusually large prospects as a $15,000,000 transpacific zeppelin expenditure, comprising hangars and mooring masts at Los Angeles, Akron, Hawaii and the Philippines, a 62-mile tie-in between two southern California systems, costing $850,000, and extending between San Bernardino and Seal Beach, a $4,000,000 paper mill for Port Angeles, Wash., and a $1,000,000 chemistry building for the University of California.

One dealer in the Puget Sound area reported 40 machines from 50 hp. down

sold to a pulp and paper mill, lumber mills and dealers; another was for ten machines from 25 hp. down to a lumber mill; another for eight 1,000-gal. pumps and eight 50-hp. motors to a pulp mill. The sale of $4,000 worth of miscellaneous switchgear to a central station is reported. Specifications are expected shortly for about $100,000 worth of electrical equipment for a combined saw and pulp and paper mill in Everett for the Puget Sound Pulp & Timber Company. Expenditure of approximately $1,000,000 is planned by the British Columbia Electric Railway in erecting high-tension power lines from the Ruskin development, a distance of 20 miles, the project also involving enlargment of Burnaby substation and installation of oil circuit breakers, switchboards, etc., costing in excess of $200,000. A contract for constructing an outdoor substation and 18 miles of 44,000-volt transmission line from Shelton to McCleary, Wash., for the Simpson and McCleary Timber Companies has been awarded to R. R. Poppleton & Company, Seattle. The city of Seattle bought 15,000 locust wood pins for $36.50 per thousand and is taking bids for 60,000 lb. of weatherproof, soft-drawn copper wire. The Board of Contracts and Awards, Tacoma, is taking bids for 200,000 ft. of No. 10 B. & S., single conductor. The Westminster Paper Company, Ltd., New Westminster, B. C., plans immediate reconstruction of the first unit of its plant destroyed by fire the ultimate development costing $2,000,000.

CONSTRUCTION PROJECTS

Imperial Valley Irrigation District, El Centro, Calif., is arranging bond issue of $2,000,000, for a Diesel engine generating plant and transmission system. Empire Refining Company, Long Beach, Calif., plans rebuilding of refining plant in Signal Hill oil district, recently destroyed by fire with loss of about $70,000. Filice & Perrelli, Inc., Gilroy, Calif., plan one-story canning plant to cost $250,000. Station KGO, Belmont, Calif., plans radio broadcasting station with power house reported to cost more than $150,000. Los Angeles, Gustine, Eagle Rock and Alameda, Calif., plan ornamental lighting systems. Columbia Cement Company, San Diego, Calif., plans cement mill reported to cost more than $750,000. Link-Belt, Meese & Gottfried Company, San Francisco, Calif., plans plant for manufacture of conveying and mechanical-handling equipment to cost $350,000. Central Ice & Cold Storage Company, Los Angeles, Calif., has filed plans for an addition to cost about $65,000. Impqua Pulp & Paper Company, Gardiner, Ore., plans pulp and paper mill to cost more than $750,000. St. Paul-Tacoma Lumber Company, Tacoma, Wash., plans mill at Bellingham, Wash., to cost $200,000. Rainier Pulp & Paper Company, Shelton, Wash., plans extensions and improvements to cost more than $400,000. Dillon, Mont., plans an ornamental lighting system. Keystone Phosphate Company, Wallace, Idaho, plans phosphate mill to cost more than $100,000. Kellogg, Idaho, plans an ornamental lighting system. Little Pittsburgh Mining Company, Wallace, Idaho, plans flotation mill, reported to cost more than $150,000. Colorado Milling & Elevator Company, Denver, Colo., plans grain elevator to cost about $70,000. Public Service Company of Colorado, Denver, Colo., plans extensions and improvements.

SOUTHEAST

VOLUME of electrical business in the Southeast was reasonably well sustained last week.

CONDITIONS are spotty, but on the whole the outlook for the next few months is bright.

A power company in Florida ordered power transformers amounting to $25,000, while a Georgia company's small power and distribution transformer purchases last week aggregated $10,200. Another transformer order was from Tennessee and amounted to approximately $4,000 for the distribution type. A Georgia company's wire and cable orders in the past ten days totaled $7,500 and an Alabama company ordered a carload of stranded bare copper. Two power companies in the Carolinas ordered one car each of weatherproof copper wire. Some other central-station orders were for storage batteries amounting to $4,800 and house type meters costing $2,800 and $1,200 in creosoted pine poles. The city of Atlanta ordered automatic stoker equipment costing $25,000 for the city water pumping station. Bids will be asked shortly on approximately $75,000 worth of motor and control equipment for a Georgia steam station and in about 60 days on approximately $200,000 in transformers, breakers and switches for a water power development in the same state.

CONSTRUCTION PROJECTS

Kentucky Utilities Company, Louisville, Ky., plans transmission line from Lexington to Maysville, Ky., to cost more than $85,000. Tennessee Cereal Company, Franklin, Tenn., plans cereal mill to cost $110,000. Hermitage Laundry Company, Nashville, Tenn., plans plant to cost $100,000. South Carolina Pottery Company, North Augusta, S. C., plans addition to plant to cost more than $70,000. Alabama Power Company, Birmingham, Ala., plans extensions in transmission lines in rural districts to cost more than $500,000. J. N. McDonald, First Bank & Trust Company Building, Sarasota, Fla., and associates have secured permission for a hydro-electric power plant to cost $1,000,000. Tampa, Fla., plans installation of floodlighting system and beacon lamps at proposed municipal airport to cost $750,000.

Activities of the Trade

Westinghouse Receives Equipment Order

The Westinghouse Electric & Manufacturing Company recently received an order for all the electrical equipment for the main drive of a beam mill to be installed at the South Works of the Illinois Steel Company at South Chicago, Ill.

This mill will be used to produce a wide flange section which differs from the standard I-beam in that the flanges are of uniform thickness instead of being tapered and the thickness of the metal in the flanges can be varied over a wide range. Due to its special features, this section has come into heavy demand in building construction. Special engineering study has been given to this mill and several modifications have been made in usual mill and electrical designs.

Square D Company Adds to Sales Organization

J. J. Mitchell, previously branch sales manager of the Square D Company in Cleveland, Ohio, one of Square D's most expert panelboard men, has been transferred to the general offices in Detroit and placed in charge of all of the company's panelboard sales. The position of Cleveland branch sales manager has been given to M. W. Parmalee, previously Square D sales representative in Cleveland. The addition to the Square D sales organization is R. C. Thompson, formerly of the Moock Electric Supply Company, Canton, Ohio, who succeeds Mr. Parmalee as sales representative in Cleveland.

ALLIS-CHALMERS MANUFACTURING COMPANY has appointed A. D. Brown district manager of the Buffalo, N. Y., office to succeed M. W. Phelps, resigned.

GARRETT BURGESS, INC., 5050 Joy Road, Detroit, Mich., has been appointed by the Triumph Electric Corporation, maker of electric motors, as representative for Detroit and surrounding territory.

KUHLMAN ELECTRIC COMPANY, Bay City, Mich., manufacturer of power, distribution and street lighting transformers, announces the appointment of Frank C. Fassett of Phoenix, Ariz., as its representative in that territory.

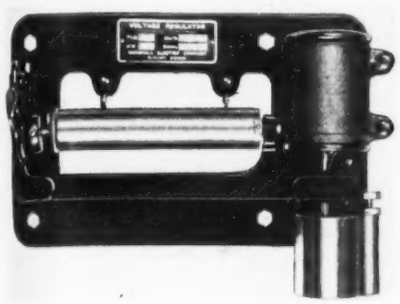
INCA MANUFACTURING CORPORATION, Fort Wayne, Ind., has announced the appointments of Paul Stauffer as Eastern manager with headquarters at Newark, N. J., and of R. A. Connor to the sales and engineering staff of the Inca organization at Fort Wayne.

KELVINATOR CORPORATION announces that the new Kelvinator heavy-duty commercial units are now in production. These units, involving the principle of the liquid head cooled heavy duty compressor, were shown for the first time at the National Electric Light Association convention at Atlantic City this year.

New Equipment Available

Automatic Voltage Regulator for Generators

A new automatic voltage regulator for alternating- and direct-current generators from the smallest to the largest system is announced by the Marshall Electric Company, Elkhart,



Ind. It consists of a carbon pile resistance unit in series with the field of a direct-current exciter or generator. The carbon pile is compressed by gravity and released by an electromagnet. The weight of the parts and the pull of the magnet balance. No springs are used. It is rugged and substantially made with no wearing parts.

In conjunction with the large direct-current generators and exciters for large generators, the regulator is used to adjust the speed of an adjustable-speed motor-driven rheostat or a large magnet-operated rheostat. There are no make-and-break contacts of any kind. The adjustment is very simple and when once set will remain in that setting.

These regulators are in use as speed regulators on adjustable-speed, shunt-wound, direct-current motors on paper-making machinery. They are also suitable for assisting synchronous alternating-current motors on exceedingly variable lows in maintaining power factor.

Dual-Drive Welding Unit

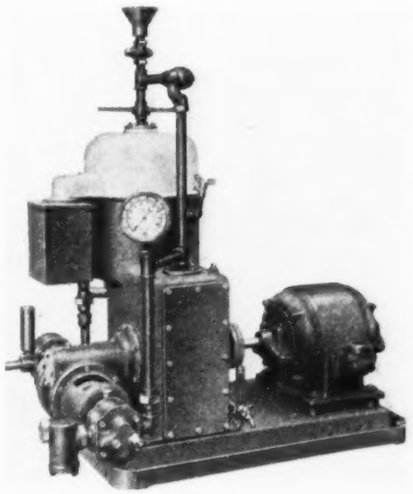
A new dual-drive arc-welding unit, consisting of a standard 300-amp. single operator welding generator, a 15-hp. alternating-current induction motor and a six-cylinder, 1,800-r.p.m. model P-45 Continental gas engine, all mounted in tandem on a structural steel-welded base, is announced by the Westinghouse Electric & Manufacturing Company. The motor operates on 220 volts, but by reconnecting the external motor leads and changing the line starter coil it can be used on 440 volts, thereby giving additional flexibility to the complete unit. The welding generator can be driven by either the gasoline engine or the electric motor by simply engaging or disengaging a slip coupling or clutch, whichever is provided.

The dual-drive welding machines can be furnished in all the popular single operator ratings, stationary or portable. The motor can be furnished to operate on practically all industrial power circuits wherever electric power is available. In isolated places the engine is used for driving power, providing a a flexible welding unit independent of local power limitations.

Compact, Self-Contained Oil Purifier

To meet the demand for a complete, compact, direct drive centrifugal purifier for purifying oil in lubricating systems and for various applications in process work the Hydroil Corporation announces its new No. 50 D Hydroil centrifugal purifier. New features claimed for the purifier include:

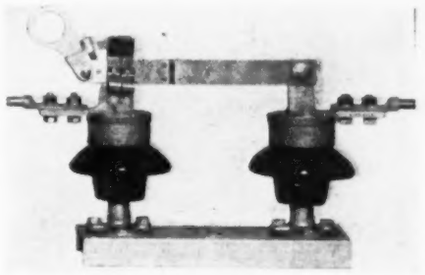
Direct drive, using any standard speed motor of any standard specifications; a complete, compact unit of comparatively small dimensions; completely inclosed, vapor-tight, non-aërating machine suitable for handling lubricating, insulating or fuel oils or any of the volatile oils; direct-connected pumps with piping arrangement to suit any conditions; standard Hydroil bowl combining all of the features of simplicity, ease of cleaning, with interior arrangement to suit oil of any viscosity or specific gravity. Bowl can be used either as a purifier



or a clarifier and adaptable to the separation of any two liquids of a different specific gravity; equipped with standard size ball bearings throughout. Lubricated by a splash system with all parts oiled from a central oil reservoir; machine can be equipped with heater or with a filter attachment if desired; automatic control of oil flow and automatic heat regulation control; machine can be arranged with special base plates to fit any particular location, for either floor mounting or wall mounting; capacity, 300 to 500 gal. per hour; centrifugal force of bowl 7,000 times.

Disconnect Switch with Interchangeable Insulator Units

A single-pole outdoor-form disconnecting switch with interchangeable insulator units has been developed by the Champion Switch Company, Kenova,



W. Va. The blade is of the truss form and the tongue engages a new form of self-aligning full-floating contacts with blade guides. The switch illustrated is rated 7.5 kv., 300 amp., but the same type is made for the various voltages and ampere capacities.

Gas-Engine-Driven Portable Arc Welder

A new portable arc-welding machine, driven by a six-cylinder gas engine, replacing the four-cylinder engine-driven unit previously included in the company's line, is announced by the General Electric Company. Advantages claimed are ease of starting, steadiness of operation and greater capacity. The generator bears the designation WD-300-A.

The welding generator is a ball-bearing, self-excited single-operator machine, rated 300 amp., one hour, 50 deg. C. with a current range of 90 to 375 amp., in accordance with National Electrical Manufacturing Association standards. Included with the set is a current-reducing resistor, by means of which welding currents down to 25 amp. may be obtained. The current can be adjusted simply by turning the brush-shifting handle. When operating, so that the potential at the generator panel, including reactor drop, is 25 volts, any value of current can be obtained between 25 and 400 amp.

A 500-amp. ammeter and a 120-volt voltmeter are mounted on the generator panel. A self-adjusting stabilizing reactor automatically steadies the arc. The automatic regulation is obtained by specially designed magnetic circuits without any moving parts, according to the manufacturer.

The complete outfit is mounted on a welded structural base and may be made portable by the addition of running gear. The net shipping weight, including running gear, is 3,930 lb.

Electrical Patents

Announced by U. S. Patent Office

(Issued October 15, 1929)

1,731,442. TROLLEY EAR; A. Scott, Cleveland, O. App. filed May 29, 1928.

1,731,449. ELECTRIC HEATER; W. E. Addicks, New York, N. Y. App. filed Feb. 11, 1924.

1,731,456. CHROMIUM-PLATING MACHINE; W. S. Eaton, Sag Harbor, N. Y. App. filed Oct. 28, 1926.

1,731,462. STARTING SWITCH FOR SYNCHRONOUS MOTORS; C. T. Hibbard, Minneapolis, Minn. App. filed Nov. 23, 1926.

1,731,472. RADIATOR; T. E. Murray, Brooklyn, N. Y. App. filed Feb. 17, 1927.

1,731,486. ELECTRICAL INSULATION; W. C. Geer, Akron, O. App. filed July 9, 1925.

1,731,489. SWITCH; H. J. L. Frank, Detroit, Mich. App. filed Sept. 15, 1922.

1,731,502. ARC-WELDING TOOL; J. H. Paterson, Westminster, London, England. App. filed Aug. 7, 1928.

1,731,513. ELECTRIC SIGN FLASHER; H. N. Wagner, Los Angeles, Calif. App. filed June 2, 1926.

1,731,541. WELDING MACHINE; H. S. Powell, Utica, N. Y. App. filed July 28, 1927.

1,731,580. ELECTRIC SWITCH MECHANISM; G. A. Knaak, Milwaukee, Wis. App. filed Sept. 2, 1924.

1,731,594. TRANSFORMER CUT-OUT; R. W. Shoemaker, Turlock, Calif. App. filed May 12, 1928.

1,731,506. HEATING APPARATUS FOR PAPER-MILL SURGE TANKS; E. Simzer, Potsdam, N. Y. App. filed April 23, 1928.

1,731,597. WATER-TIGHT ELECTRICAL CONNECTION; L. Y. Spear, New London, Conn. App. filed Feb. 20, 1928.

1,731,612. TEMPERATURE INDICATOR FOR ENGINES; C. A. Dunham, Glencoe, Ill. App. filed Dec. 4, 1922.

1,731,616. ELECTRICAL-CURRENT-WAVE-CHANGING DEVICE; P. D. Flehr, Oakland, Calif. App. filed Nov. 12, 1925.

1,731,620. ELECTRODE-ADJUSTING MECHANISM FOR DEHYDRATORS; R. J. Gertzen, Oilmont, Mont. App. filed May 15, 1928.

1,731,624. ELECTRICALLY-HEATED STEAM RADIATOR; A. J. Henry, Los Angeles, Calif. App. filed Nov. 6, 1926.

1,731,627. ELECTROTHERAPEUTICAL INSTRUMENT; C. J. Johnson and A. B. Johnson, Louisville, Ky. App. filed June 6, 1927.

1,731,644. EXCITER CHANGERS FOR SYNCHRONOUS ELECTRICAL MACHINES; J. R. Watson, Chicago, Ill. App. filed Aug. 15, 1925.

1,731,652. ELECTROSTATIC CONDENSER; W. Dubilier, New York, N. Y. App. filed Oct. 25, 1922.

1,731,653. ELECTRICAL CONDENSER; W. Dubilier, New Rochelle, N. Y. App. filed June 1, 1925.

1,731,661. ELECTRICAL CURRENT TAP PLUG OR CONNECTER; P. A. Hauenstein, Buffalo, N. Y. App. filed May 14, 1926.

1,731,669. LIGHTING FIXTURE; W. W. Kantack, St. Albans, N. Y. App. filed May 5, 1928.

1,731,671. ELECTRIC VAPORIZING ATTACHMENT; E. Kosanek, Yonkers, N. Y. App. filed April 5, 1928.

1,731,685. ELECTRIC-METER PROTECTIVE MEANS; T. Reyman, New York, N. Y. App. filed July 9, 1926.

1,731,706. FLAME-PROOF SWITCH MECHANISM; C. B. Coates, Cleveland, O. App. filed May 5, 1925.

1,731,737. TROLLEY; J. J. Cumming, Boston, Mass. App. filed March 30, 1928.

1,731,756. ELECTRIC SWITCH; T. M. Snyder, Verona, N. J. App. filed May 28, 1927.

1,731,775. HANGER; W. A. Heinrich, St. Louis, Mo. App. filed May 3, 1926.

1,731,789. ELEVATOR SIGNAL SYSTEM; C. E. Orr, Orange, N. J. App. filed Dec. 14, 1928.

1,731,796. INSULATOR GAP; E. E. Schmid, Deceased, Late of Hollis, N. Y. App. filed June 9, 1927.

1,731,808. SWITCHING APPARATUS; L. T. Barnes, Hempstead, N. Y. App. filed June 15, 1926.

1,731,812. PROTECTIVE SWITCH BOX; A. E. Blackman, Mount Vernon, N. Y. App. filed June 25, 1926.

1,731,822. THERMOSTAT; E. A. Mau, New Britain, Conn. App. filed March 5, 1925.

1,731,861. MAGNETIC CORE; H. F. McRell, Pittsfield, Mass. App. filed April 5, 1929.

1,731,864. AUTOMATIC RECLOSING CIRCUIT-BREAKER SYSTEM; C. McL.Moss, Pittsburgh, and W. R. Farley and A. J. A. Peterson, Wilkinsburg, Pa. App. filed Dec. 21, 1922.

1,731,865. CURRENT TRANSFORMER; E. Pfiffner, Frybourg, Switzerland. App. filed April 2, 1925.

1,731,866. CIRCUIT-CONTROLLING SYSTEM; C. W. Rice, Schenectady, N. Y. App. filed May 19, 1928.

1,731,882. ELECTRIC PERCOLATOR; C. B. Backer, Brooklyn, N. Y. App. filed June 16, 1926.

1,731,883. REGULATING SYSTEM; T. F. Barton, Upper Montclair, N. J. App. filed Aug. 15, 1928.

1,731,884. CONDENSER; J. A. E. Belt, Schenectady, N. Y. App. filed Nov. 12, 1926.

1,731,890. CONDENSER; E. D. Eby, Pittsfield, Mass. App. filed Sept. 2, 1927.

1,731,892. INSULATED COLLECTOR; R. E. Ferris, Swissvale, Pa. App. filed May 31, 1927.

1,731,893. ELECTRIC CONNECTER; C. Fischer, West Homestead, Pa. App. filed June 4, 1927.

1,731,894. CASING FOR TRANSFORMERS; W. F. Frisch, Pittsfield, Mass. App. filed March 31, 1928.

1,731,903. THERMOSTATIC REGULATOR; A. J. Mottlau, Pittsburgh, Pa. App. filed April 8, 1924.

1,731,906. ALTERNATING-CURRENT ELECTRIC SYSTEM; W. Petersen, Darmstadt, Germany. App. filed March 7, 1927.

1,731,917. AUTOMATIC SWITCHING SYSTEM; A. E. Anderson, Scotia, N. Y. App. filed Feb. 1, 1927.

1,731,918. AUTOMATIC SWITCHING SYSTEM; A. E. Anderson and H. Bany, Scotia, N. Y. App. filed April 28, 1927.

1,731,919. PROTECTIVE SWITCH BOX; A. E. Blackman, Mt. Vernon, N. Y. App. filed July 29, 1924.

1,731,932. ELECTRIC SWITCH; G. J. Meuer, Milwaukee, Wis. App. filed Feb. 10, 1926.

1,731,934. ELECTRIC WELDING APPARATUS; P. O. Noble, Schenectady, N. Y. App. filed Sept. 19, 1918.

1,731,936. AUTOMATIC RECLOSING CIRCUIT BREAKER; A. J. A. Peterson, Wilkinsburg, Pa. App. filed April 16, 1923.

1,731,937. ELECTRICAL ALARM FOR THERMOSTATS; H. Piquet, Jacksonville, Fla. App. filed Aug. 15, 1927.

1,731,939. CONTROLLER FINGER; E. E. Rose, Edgewood, Pa. App. filed Nov. 21, 1925.

1,731,940. TROLLEY SYSTEM; W. Schaake, Pittsburgh, Pa. App. filed July 15, 1927.

1,731,941. ELECTRIC METER; G. R. Schuck, Seattle, Wash. App. filed March 17, 1927.

1,731,942. CEILING ELECTRIC-LIGHT FIXTURE; L. Simmons, Washington, D.C. App. filed Sept. 23, 1926.

1,731,949. HOT-TOP TABLE; A. A. Span, O. A. Sunde and L. T. Sunde, Seattle, Wash. App. filed Jan. 10, 1929.

1,731,952. SYNCHRONIZING RELAY SYSTEM; P. Thomas, Edgewood, Pa. App. filed Sept. 19, 1927.

1,731,955. PROTECTIVE ARRANGEMENT; A. von Schaubert, Berlin, Germany. App. filed July 15, 1927.

1,731,965. AUTOMATIC RECLOSING CIRCUIT-BREAKER SYSTEM; A. E. Anderson, Scotia, N. Y. App. filed Jan. 25, 1927.

1,731,966. AUTOMATIC RECLOSING CIRCUIT-BREAKER SYSTEM; A. E. Anderson, Scotia, N. Y. App. filed June 27, 1927.

1,731,971. PROTECTIVE ARRANGEMENT; E. Courtin, Wilmersdorf-Berlin, Germany. App. filed Dec. 16, 1927.

1,731,973. ELECTRIC CONNECTOR; C. Fischer, West Homestead, Pa. App. filed July 11, 1927.

1,731,975. SIGNAL MEANS FOR ELEVATORS; W. H. Grover, Maumee, and C. E. Merritt and W. S. Pooley, Toledo, O. App. filed April 1, 1926.

1,731,976. PROCESS FOR PRODUCING METALS AND ALLOYS; T. R. Haglund, Stockholm, Sweden. App. filed Oct. 16, 1926.

1,731,977. ROTARY DISTRIBUTOR FOR USE IN TELEGRAPH OR LIKE SYSTEMS; H. H. Harrison, Liverpool, and S. R. Smith, London, England. App. filed Dec. 31, 1925.

1,731,981. RECTIFIER FOR ALTERNATING CURRENTS; C. E. Ogden, Cincinnati, O. App. filed Aug. 1, 1921.

1,731,989. ELECTRIC OUTLET DEVICE; H. E. Slade, Glen Ridge, N. J. App. filed Feb. 21, 1927.

1,731,993. IGNITION-COIL LOCK; H. G. Webster, Chicago, Ill. App. filed Sept. 4, 1923.

1,731,995. ELECTRIC WATER HEATER; P. Ambory, Hazel Park, Mich. App. filed Nov. 12, 1928.

1,732,069. DRY CELL WITH EXTENSIBLE COATING; A. W. Schorger, Madison, Wis. App. filed May 27, 1927.

1,732,076. BATTERY-SEALING-COMPOUND-REMOVING TOOL; E. J. Alderman and C. N. Nickelson, Jr., Muscatine, Ia. App. filed June 6, 1928.

1,732,117. METHOD FOR OXIDIZING POTASSIUM FERROCYANIDE TO POTASSIUM FERRICYANIDE; R. Brandt, Bergdorf, near Hamburg, Germany. App. filed Oct. 16, 1928.

New Trade Literature

SAFETY SWITCHES.—The Westinghouse Electric & Manufacturing Company is distributing its 1929 catalog, No. 282, on safety switches and motor-starting switches. This catalog gives the distinctive features and detailed data on all classes and kinds of Westinghouse safety switches, motor-starting switches, cutouts, line starters, meter service switches, panelboards and wiring devices, including tapes, fuses, conduit bushings and the like. Many illustrations are shown, including photographs, dimension drawings and wiring diagrams of all types of switches. Price forms, comparative style number indexes, wiring tables and the National Electrical Code (1928) regulations on switches and motor protection are also contained in the book.

CHRISTMAS LIGHTING.—The Society for Electrical Development, Inc., has compiled a plan book entitled "Outdoor Christmas Lighting," designed to serve as a guide in the use of light for Christmas decorations throughout the country. Part I discusses in general terms the special value of local contests and Part II gives definite details of the methods to be pursued in working out the organization of the contest and in conducting it to a successful conclusion.

POLES.—The engineering department of J. F. Prettyman & Sons, Charleston, S. C., has prepared two instructive booklets of great value to those who are interested in forest products. Bulletin No. 1, entitled "Air Seasoning of Timber and Climatological Conditions Which Affect It," discusses at length the drying of timber, the important factors to be considered in the process, such as relative humidity, temperature and circulation. This six-page catalog contains an interesting table giving climatological data furnished by the United States Weather Bureau. Bulletin No. 2, entitled "Mechanical Properties of Certain Woods Used for Poles," discusses the properties of certain species and their uses.

OVENS.—The Despatch Oven Company, Minneapolis, Minn., has just issued new bulletins on japanning and enameling ovens. They tell about construction details, heating and ventilating systems in gas and electric ovens which are used for the baking and drying of japans, enamels, varnishes, lacquers, paints and other finishes which must be baked on a high-speed basis and still maintain low operating costs.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is sought in Lyon, France (No. 41,680), of electric bell signaling systems.

Agency is sought in Helsingfors, Finland (No. 41,681), for paper-insulated high-tension cables.

Purchase is sought in Ensenada, Mexico (No. 41,746), of electrical fixtures.

Agency is sought in Paris, France (No. 41,719), for electric furnaces.

Purchase and agency are sought in Glasgow, Scotland (No. 41,768), for electric heating and cooking devices, all sizes, medium and high grade.

Purchase and agency are sought in Milan, Italy (No. 41,731), for household electrical appliances.

Purchase is sought in Calais, France (No. 41,741), for household labor-saving devices.

Purchase is sought in Tia Juana, Mexico (No. 41,744), of electric light and power equipment.

Agency and purchase are sought in Toronto, Canada (No. 41,756), for motors and small electric meters.

Agency is sought in Paris, France (No. 41,719), for electric baking ovens.

Agency is sought in Wellington, New Zealand (No. 41,736), for electric paint sprayers.

Agency is sought in Munich, Germany (No. 41,709), for electric washing and ironing machines.

Purchase is sought in Birmingham, England (No. 41,716), of welding machine.